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PSYCHOLOGY OF LEARNING, GENERAL METHODS OF TEACHING, AND SUPERVISION

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Volume VI **June, 1936** **Number 3**

Psychology of Learning, General Methods of Teaching, and Supervision

(Literature reviewed from January 1, 1933 to January 1, 1936)

Prepared by the Committee on Psychology of Learning, General Methods of Teaching, and Supervision: W. A. Brownell, Prudence Cutright, M. E. Irwin, E. O. Melby, and G. T. Buswell, *Chairman.*

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Erratum

Through an unfortunate circumstance, the following names were omitted from the manuscript of the chapters entitled "School Marks" and "Recording and Reporting" in the *Review of Educational Research*, Volume VI, No. 2, April, 1936:

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INTRODUCTION

WITH ONE OR TWO EXCEPTIONS the literature reviewed in this issue is limited to the period from January 1, 1933, to January 1, 1936. The general organization followed is the same that was used in the previous *Review of Educational Research* issued in October, 1933. In the introduction to that bulletin the committee expressed its position in regard to the topic of supervision and explained in some detail the difficulties encountered in finding research studies which could be clearly allocated to this topic. The position of the committee was criticized by some of the members of the Association who thought that the bulletin did not give adequate treatment to supervision. For the present bulletin the committee encountered the same type of difficulties which were described in the introduction to the 1933 report. In order to get an entirely independent treatment of the topic in the present issue, the assignment was given to Dean E. O. Melby, who was not a member of the earlier committee.

In many cases studies could be classified with equal propriety under the general heading of learning or methods of teaching. In the present issue the principle followed was to include under methods those studies which were more or less directly related to classroom situations, and to include under learning, studies which were carried on under conditions resembling the laboratory more than the classroom. Readers who are interested in either learning or methods of teaching are advised to read the chapters dealing with both topics.

As in the previous report, it should be understood that the committee does not in any sense guarantee the validity of conclusions except in the case of such studies as are the object of explicit criticism.

G. T. BUSWELL, *Chairman,*
Committee on Psychology of Learning, General Methods of Teaching, and Supervision.

CHAPTER I

Theoretical Aspects of Learning and Transfer of Training

THEORETICAL ASPECTS OF LEARNING[1]

THE SELECTION OF STUDIES on the theoretical aspects of learning for this summary presents peculiar difficulties. One wishes to note all "significant" researches—that is, significant for education as a practical enterprise. But it is precisely at this point that selection becomes unsatisfactory. What studies *are* significant? How direct and how immediate must this significance be? Studies now passed over as not being "significant" may well, in the course of a few years, be better recognized for their true worth.

The reviewer can only set limits which to him seem to be judicious. The studies selected according to these limits are grouped and discussed below under five heads. For the benefit of readers who want to set wider or different limits the bibliography includes references (7, 8, 26, 29, 36, 37, 44, 52, 53, 70), which contain classified lists of studies on learning published in the years 1933-35, and in earlier years as well. Or they may consult the index numbers of *Psychological Abstracts* for these three years, referring to the topic "learning."

Theories of Learning

Gengerelli (26:1) recognized that it "requires presumption, if not considerable foolhardiness, to advance at the present time any neurological considerations in an effort to unify some of the many and varied phenomena which constitute the field of learning. In this respect we are suffering from a reaction to the unbridled physiological speculations in which psychologists even slightly interested in this highly important field of study have indulged." Nevertheless he ventured "the skeleton framework of a possible neurological theory." Listing five necessary postulates, he developed a theory which repudiates completely the "telephone" conception of the nervous system and which lends support, he believes, to the Gestalt position.

Washburne (69) outlined his "Closure Theory" in some detail. Finding the synaptic theory "reasonable but inadequate" with respect both to physiology and to psychology, he proposed an "electro-chemical theory." "The closure theory proposes that in the interrelation between these two polarizations (transverse and longitudinal in the resting nerve) lies the

[1] Chapters II and III, also on learning, necessarily raise questions concerning the theoretical aspects of learning—a fact which will lead the reader himself to supplement the references and discussions in this chapter.

explanation of all learning phenomena. It proposes that the fundamental change which occurs in human learning is a change in patterns of the polarization of resting neurones" (69:101). The theory, Washburne claimed, rests upon admitted facts of physiology and physics.

In addition to these attempted descriptions of the neurological bases of learning, mention should be made of several efforts to formulate coherent accounts of the learning process itself. Guthrie (28, 29) sought to explain all learning in terms of a single principle, namely, the law of association by temporal contiguity. McDougall (50), for the first time giving space to a chapter on learning in one of his texts, presented an outline of a theory which agreed with the principles of his particular dynamic psychology. The literature on the conditioned reflex was organized by Hull (36), and new data were offered by Liddell (47). Probably the most authoritative statement of the Gestalt theory of learning is to be found in Koffka's new text (42). McGeoch's views on learning have been summarized (52).

The Functions of Various Muscular and Neural Mechanisms

Under this head it will be possible only to sample the many available studies. The function of the cerebrum in learning has been the object of continued investigation and discussion. Lashley's summary (44) covered the work done prior to 1934 on the cerebrum as well as on other neural mechanisms. Franz and his associates (24) reported studies on cerebral dominance in visual learning.

Krechevsky (43) departed from traditional experimental practice by attempting to secure measures other than those of rate and errors in maze learning. Using 100 rats whose cortical areas had been destroyed in varying degrees he secured data which could not be explained purely in terms of the gross amounts of cortical tissue which had been destroyed. Instead, learning seemed to be a complex function of at least two anatomically delimited cortical areas. This hypothesis, Krechevsky insisted, does not contradict Lashley's views of cerebral functioning, but rather "attempts to reconciliate the facts of functional specialization in the brain with the facts and principles of the 'field' theories, by postulating the presence of anatomically localized 'structuring' areas in the brain."

The extreme difficulty of experimental work on the function of subcortical mechanisms in learning was explained and illustrated by Brown (8), who also reviewed and criticized earlier studies in this field.

Harlow and Stagner (31) reported what they claim to be the first experimental attempt to test directly the importance of the end-movement in learning. None of their animals, whose skeletal muscles had been completely paralyzed by means of curare, was able even with thirty repetitions to learn a simple reaction which was mastered by control animals with less than three repetitions. The authors (31:293) saw certain implications for educational psychology: "The importance of pupil activity in the learning process is emphasized since it appears that the presentation of

stimuli alone will not cause learning if no reaction is made." Such implications are, however, extremely debatable.

The last of the studies in this group presents few quantitative data. Hunter (38) criticized adversely two popular notions regarding the effects of learning. He contended that proprioception does not take over the control of behavior as learning progresses, and further that "consciousness" does not eventually lapse in favor of complete automaticity.

Controversial Articles

One does not wonder that the practical educationist loses patience when he reads the confusing and confused arguments between the various psychological schools. Reading, for example, that Gestalt represents a direct attack upon behaviorism, one is hardly prepared for the claim of a prominent exponent of its doctrines that he is a "radical behaviorist" (57). Again, understanding from the words of its advocates that Gestalt is an effective answer to mechanistic psychology, one is surprised to learn that the mechanistic conceptions of Gestalt are among its chief merits (9).

The situation is bewildering. It is more than that. To an impartial psychologist it is even "a depressing thing to note the acrimony that is allowed to creep into what purports to be scientific discussion of natural science events, the acrimony varying pretty directly with the youthfulness of the schools represented, and taking its saddest form in a vituperative reading out of the field of learning any phenomena of change or improvement that fails to qualify by coinciding with a given school's favorite formulation" (19).

On the one hand, Brown and Feder (9) attempted the difficult feat of spanking Thorndike for his "ignorance" of experimental work done by the Gestalt school, ending with a plea that Thorndike repent of his error and lead his flock back to the fold of the true faith of Gestalt. On the other hand, Curti (18), reviewing a text written by two Gestalt psychologists, finds in these authors similar evidence of "ignorance"—this time of the work of non-Gestalt psychologists on learning.

As might have been expected, the announcement of a reformulation of his views of learning by Thorndike, always a preferred target for Gestalt supporters, has been met by attack. Thus, Brown and Feder (9) attempted to show that Thorndike's five new concepts are really postulates of the Gestalt system. They are especially certain that the concept of "belongingness" is a good Gestalt term, and should be so recognized by Thorndike. The same concept of "belongingness" has been subjected to criticism and to experimentation by Hsiao (33), who secured data inconsistent with Thorndike's statements concerning the nature of "belongingness." Not the least of Hsiao's objections to the concept is that its logical implications are "undesirable for theory and experimental research."

Ogden (57) attempted to explain in simple language just what Gestalt is. "A Gestalt theory of learning posits a completely integrated behavior

which can be improved by the elaboration of partial patterns within the whole." Failure to accept Gestalt is due, he thinks, to the following facts: (a) the theory was "made in Germany"; (b) it is not correctly understood; and (c) it is opposed by a "naive adherence . . . to a mechanistic interpretation of behavior and its phenomena."

Bellows (4) presented an interpretation of memory in terms of Gestalt that is full of interesting possibilities; and, as already mentioned, Koffka (42) elaborated the Gestalt view of learning into a coherent theory.

Gestalt psychology, or at least the Wheeler-Perkins formulation of Gestalt, was examined carefully by Curti (18) and by McGeoch (51) in references which can be recommended.

Applications of Gestalt to Educational Practice and Theory

Taylor (65) wrote on the significance of Gestalt psychology for engineering education, and Wheeler (71) applied his system of thinking to the teaching of arithmetic. Carr (13) saw in Gestalt psychology much which parallels the philosophy behind progressive educational theory and practice.

One study, that by McConnell (49), purported to submit the Gestalt theory of learning to a practical test in teaching the number combinations in the primary grades. A system of instruction approved as adequately meeting the criteria of the Gestalt approach was tried against a system based upon drill technics. Accuracy and time measures favored the traditional methods by statistically reliable differences. When the measures taken were those of transfer and of methods of thinking, a slight, but statistically unreliable, advantage lay with the Gestalt methods.

Common Ground among the Conflicting Schools

Three articles (18, 19, 51) already referred to have suggested the desirability of holding to the gains already made at the same time that room is made for the newer findings of Gestalt on learning.

The article by Dashiell (19) presented this position with special clarity and force. He asserted that there are many points of agreement between the different schools. These schools he subsumed "without violence" under three categories—(a) the conditioned-response school, (b) the trial-and-error school, and (c) the Gestalt school. Citing experimentation by members of the three schools, Dashiell showed that all agree with respect to eleven main features of learning:

1. The subject must be motivated.
2. A field or complication of motives exists.
3. Obstruction is offered to the principal motive.
4. Hyperactivity is aroused.
5. The response is multiple and varied.
6. The response is to relations of stimuli.
7. The most important relationship is between means and objective.
8. Selection or least action occurs.

9. The selected responses originally occur fortuitously.
10. The effects of the responses are crucial.
11. The rate of learning varies in degree from gradual to abrupt.

Divergence of opinion, Dashiell asserted, is due to (a) an apparent attempt to identify types of learning with the phylogenetic or genetic series and to (b) rationalization from the technics themselves. (Thus, the conditioned-response psychologist deals with elements in isolation and wants to interpret all behavior accordingly.) The data found and the interpretation placed thereon depend in turn upon how far the investigator goes (a) in his experimental analysis and (b) in testing the capacity to respond to relationships. In conclusion, there is "no such thing as an *isolated* conditioned response . . . or *pure* trial-and-error . . . or wholly spontaneous insight" (19:275).

Concluding Statement

Whether or not psychologists of the different schools accept the position outlined by Dashiell, that position has much to commend it both for the practical business of educating children and for the direction of educational research on learning. Quite apart from the unpleasant emotions engendered by disputation, other unfortunate outcomes are apt to result from premature and too exclusive formulations of learning theories.

In the first place, the theories, rather than learning itself, tend to become the objects of research interest. This is precisely what happened upon the announcement of Thorndike's original conception of the learning process. If part of the energy expended upon testing the validity of the law of effect, for example, had gone into the investigation of learning itself, psychology and education alike would have profited. It is to be hoped that Gestalt psychologists will not precipitate another period of misdirected effort.

In the second place, inference from any learning theory is an uncertain means of deriving educational practice (10). Witness the common citation of the principle of "learning by doing," to justify the most unlike procedures. As a consequence the principle, however valid when carefully interpreted, has led perhaps as frequently to error as to sound gain. Now the Gestalt folk, with their statements about the relations between "wholes" and "parts," about learning as "differentiation" and "emergence," are on the point of furnishing educationists with a new vocabulary which may be as empty and misleading as was the vocabulary furnished by the connectionists.

In the third place, the educationist has his own learning problems to study. These problems he must study directly, and he can do so without leaning upon any particular theory of learning. What teachers need to know is how to teach spelling, for instance. That method is best which brings the best results, regardless of whether it gains support from or lends support to, Gestalt, conditioning, or trial-and-error theories. (As a matter of fact, its effectiveness will be explained equally well by the exponent of any of the three theories, in terms of his particular theory.)

With the exception of neurological investigations, the studies on transfer, unlike those on the theoretical aspects of learning, can be rather completely listed, classified, and summarized.

Critical Reviews and Practical Discussions

Bond (5) outlined the present status of the doctrine of transfer as it affects the teaching of arithmetic, and Fawcett (23) showed how mathematics may actually be taught to insure transfer. The latter article is listed, not because of any quantitative data it reports, but because of the suggestiveness of its concrete detail—badly needed in a school subject for which unbridled claims of transfer values are made without any apparent responsibility for specifying means and methods.

An attempt was made by Bruce (11) to formulate five laws to cover the main objective conditions under which positive and negative transfer may be expected and can be predicted.

Orata's article (58) listed most of the educational experiments on transfer made since 1927, when his first summary appeared. "In round figures," he (58:267) stated, "70% of the studies (since 1927) support the proposition that the effect of practice is general, and that therefore transfer takes place most effectively through *conscious generalization*, whereas about 30% may be classified as supporting the theory that practice is specific and that transfer therefore takes place through *identical elements*." Orata argued that transfer is now essentially a problem of educational engineering. The same position was taken by Uhl (68) who concluded that "'common sense' and science agree" on the fact of transfer, and that the educational problem is to discover how best to secure transfer in abundance. Nevertheless, "for some inexplicable reason, professors of education are opposed to 'transfer.'"

To Poffenberger (59) the reason is not, however, so "inexplicable." Tracing the history of experiment and discussion on transfer, this author advanced two reasons why twentieth century faith in transfer all but disappeared during the first quarter of this century. These reasons are (a) the unfortunate emphasis of the original studies "upon *limitation* of spread of influence as against unlimited spread" and (b) the "use of the term 'identical'" to account for the results obtained.

Laboratory Studies of Transfer[2]

Nine of the fifteen subjects in Shipley's experiment (63) showed what appeared to be transfer, when they withdrew their hand upon the flash of a light which had been previously presented simultaneously with a blow on

[2] The term "transfer" appears in certain theories designed to explain the phenomena of retroactive inhibition (7). The reader is advised that in such discussions "transfer" applies to neural elements supposed to be active in the behavior in question, a usage which in many respects agrees with Thorndike's neural conception of identical elements.

the right cheek (the conditioned S) and an electric shock on the right index finger (unconditioned S).

Using series of paired words and numbers, accompanied by letters which were irrelevant to the learning situation, Thorndike and others (67:435) found that "a reward influences not only the rewarded connection itself but also a contemporaneous neural connection attached to the rewarded connection."

Cook (14) reported that in his experiment in cross education transfer from foot to hand and from hand to foot did not differ materially.

Hulin and Katz's study (34) showed transfer in reading Braille. The subjects taught to read by tactual methods revealed more transfer to visual reading than did those trained and tested in the reverse order.

In the case of learning stylus mazes Britt (6:116) obtained evidence "that if the associations for a learning problem are of the same strength but are of unequal age, the older association is more subject to positive transfer to a second problem than is the younger association." The author was careful to point out, however, that this difference is probably not due to the age of the association alone, but to factors that must necessarily vary with its age.

The experimental study of maze learning supplied Hull (35) with data which he employed to develop a theory of transfer much like the Thorndike theory of identical elements.

McKinney (54) trained his subjects to identify four simple geometric figures, then altered one of the figures in amounts varying from 10 percent to 30 percent and from perfect symmetry to apparent asymmetry. Transfer was measured in terms of percent of responses to the altered patterns as though they were in their original form. A definite relationship was found between degree of transfer and amount of alteration. Furthermore, symmetrical changes yielded more transfer than did those which led to asymmetry. The results are interpreted as favoring the generalization theory of transfer.

Two laboratory studies approach more nearly the types of school learning. Arons (2), using measures of serial learning (playing cards) and of problem solving (Yerkes multiple choice apparatus), obtained coefficients of correlation of only .08 $\pm$ .087 and .10 $\pm$ .086. Cox (16) found that a group of students set to assemble and to take to pieces the parts of an electric lamp holder learned to perform this task quickly, but showed relatively little skill in manipulating other similar materials. Another group, whose practice was accompanied by systematic instruction on points to be observed, learned the task in hand and also demonstrated relatively greater skill with other materials.

Transfer in the School Subjects

Two investigations deal with mathematics. McConnell (49) produced evidence that instruction which puts the emphasis on meaning in primary

numbers may result in improved types of quantitative thinking which are susceptible to transfer. Lehman (46) found that only 4 percent of his college students solved arithmetic problems by algebraic methods which they showed they knew. His data point "forcibly to the fact that application of knowledge is one type of transfer" and that "the existence of identical elements is of itself no guarantee that transfer will take place."

In an unusually careful statistical analysis in which every precaution was taken to control selective factors, Whelden (72) investigated the effect of Latin upon the quality of other academic work at Yale. Students who had had more than thirty hours of Latin (and Greek) were compared with those who had had less than this amount. In terms of average marks the extra study of Latin seemed to function only in the fields most closely related (French composition, for example), in which the subjectmatter was similar to some extent. No evidence at all was secured for the extended study of Latin as "an intellectual discipline, serving to extend the scope of intellectual capacity in whatever field it might be applied" (72:497).

In another study (40), involving foreign language, 202 pupils in grades 7-12, 148 with varying experience with one to three languages, were tested on their ability (a) to translate and (b) to detect the meaning of certain words in a Spanish article on football. Transfer values were demonstrated from both sets of measures. The first year of foreign language study seemed to make the largest contribution. In subsequent study it mattered little whether the work was concentrated in a single language or was spread over as many as three.

Cooper (15) tested "the hypothesis that functional grammar taught at the college level (freshman year) and deliberately taught for transfer will carry over into composition ability." Her results, impaired somewhat by experimental difficulties, showed that the hypothesis is at least tenable.

Two studies have been made of transfer in spelling. Gilbert's investigation (27), made in grade 9, showed that pupils profited considerably in their ability to spell new words merely from meeting these words in reading. The best spellers profited most from such reading. Improvement was not dependent upon a slow rate of reading. Gates (25) reported a large-scale study (3,800 pupils, grades 2-8, 106 classes), in which two types of spelling instruction were compared. Half of the children learned each word as a specific unit. The other half studied the words in special groupings and had various generalizations and rules called to their attention. The end-tests showed (a) equal ability to spell the words set for each grade and to spell familiar words which permitted use of generalizations and rules, but (b) superiority for the generalization groups in spelling new words to which their rules would apply and in converting unstudied base forms by adding suffixes, etc.

Bedell (3) and Downing (21) discussed generalization, inference, and "scientific thinking" as these abilities are set as outcomes of instruction in science.

Jacobson (39) and Salisbury (61, 62) investigated the carry-over of improved study and reading habits to the content subjects. Salisbury's subjects (grades 7, 9, and 12), who were shown the possible applications of their newly acquired technics, clearly revealed transfer. In Jacobson's first experiment, in which the training in work-type reading was given in the English classes (grade 9), no transfer to other subjects was noted. In the second experiment, in which the training was given in the content of the subjects themselves, application of the new study technics was clearly observable.

Character Training

In a statistical investigation admittedly "preliminary," Sinclair and Tolman (64) failed to obtain any evidence that the study of science increases "open-mindedness." Their method, that of comparing measures from different collegiate institutions and from different classes within the same institution, suffered from the usual influence of selective factors.

A series of investigations have been reported on the value of *incidental* moral and character instruction in connection with plane geometry (1), the social studies (12, 41), athletics (30), and Latin (55). In the main, the conclusions agreed in being negative.

On the other hand, the effect of *direct* instruction on such traits as honesty, leadership, and attitudes toward war, patriotism, etc. (17, 22, 32, 48, 56, 60), seems to be positive. Thus, Longstreet (48) in perhaps the most carefully controlled of these studies found that changed attitudes were to be expected in the high-school social studies only when a deliberate attempt was made to instil new attitudes. The report by Hobson (32) is especially interesting as showing a method for deriving a program of direct instruction in a moral trait—honesty in this case.

Concluding Statement

It would seem to be high time to abandon the controversy between the relative merits of the "generalization" and the "identical elements" (and now the Gestalt "functional similarity") theories of transfer. The dispute served a useful purpose by keeping the issue alive during a critical period, but there seems to be no purpose in prolonging it.

The Judd theory (generalization) has consistently emphasized the importance of *subjective* factors in transfer. It is possible to interpret Thorndike's definition of identical elements [2] so as to include this same recognition of subjective factors. On the other hand, unfortunately, whether Thorndike meant it so or not, identical elements have commonly been regarded as wholly *objective* in nature. As a consequence, attempts have been made time and time again to explain the presence or absence of expected transfer

[2] "By identical elements are meant mental processes which have the same cell action in the brain as their physical correlate. It is of course often not possible to tell just what features of two mental abilities are thus identical" (66:269).

in terms of the external conditions of learning. As a matter of fact, neither of the two theories provides a basis for prediction. Both are *ex post facto* explanations: they account for the event after it has happened. There is transfer if the learner has generalized, which is to say, if he has observed identity—or vice versa. The question promptly resolves itself if one asks the question, Identical *to whom?* To experimenter or to subject, to teacher or to pupil? If this position is sound, as Orata (58:270) seems to think, then it becomes almost an absurdity to say that there is no transfer in spite of the presence of identical elements.

The position taken by Orata (58) and by Uhl (68) seems to be the sensible one so far as education is concerned. The possibility and the desirability of transfer cannot be questioned. The problem then becomes one of so organizing the materials and methods of instruction to guarantee the largest possible amount of positive transfer.

CHAPTER II

Types of Learning and General Conditions Affecting Learning

FOLLOWING THE TREATMENT of the theoretical aspect of learning and transfer of training in the preceding chapter, this chapter will review studies of certain types of learning, such as motor learning and skill, memory and association, the formation of concepts, and problem solving, and will also deal with some of the conditions affecting learning. All studies dealing with the motivation of learning, individual differences, and the relation of general intelligence to learning are reserved for treatment in Chapter III.

A number of excellent studies relating to learning in the various school subjects have been omitted from those treated in this chapter due to the fact that special numbers of the *Review of Educational Research* (92, 125) are devoted to the psychology of school subjects. However, many of the studies of the psychology of school subjects consist in applications of basic studies of learning, such as are reported in this chapter. Some other investigations which deal with the same types of learning reported here are reserved for treatment in Chapter IV, where they are reviewed as illustrations of the way methods of teaching affect learning.

Motor Learning and Skill

Ten of the studies reviewed in this chapter have to do with the formation of skills of one type or another. Since most of these experiments are basic in character, the findings are applicable to a great many of the kinds of motor learning which are carried on in the schools. Mattson (119) studied the relationship between the complexity of the skill to be acquired and the shape of the learning curve with young children. She found that the patterns of learning in the case of simple and complex skills are quite different and that while in the case of simple skills practice tended to make the different subjects more alike, the reverse was true in the case of complex skills where the greater the practice the larger were the differences in performance of the different individuals. From the data of the experiment she concluded that no amount of practice may be able to make children of low-level ability equal the performance of children of very high-level ability. Smith and Fitch (137) reported a target experiment in which seventy-five men were used as subjects. They studied the rate of learning when postural cues were artificially distorted while aiming at the target, and then followed this by studying the duration of the habits formed when the subjects returned to their natural posture, thereby getting a measure of both the establishment of a new habit and the interference of an old one.

They found that return to the old, that is, the regular posture, was impeded about two-thirds as much as the original habit impeded the performance when the posture was artificially distorted. The findings have a significant application to the many school tasks where habit interference constitutes one of the important factors in new learning. Hyde (101) used archery as the medium for studying certain characteristics of motor skill. She found a definite practice effect at each distance and that achievement in archery follows the usual form of the learning curve. She found no marked positive correlations between ability in archery and mental ability, as measured by the Otis Test. Scott and Henninger (133) reported an interesting body of data showing the relationship between length and difficulty of materials in motor learning, and also compared the results in motor learning with those in verbal learning. They found that a considerable similarity exists between motor learning and verbal learning in respect to the relationships between length of materials and relative difficulty of mastering them, but found that longer materials are somewhat more difficult in motor learning than in verbal learning.

Several studies have to do with the basic problem of method in motor learning. Crafts and Allen (84) studied two groups of subjects in learning to trace mirror images with both hands, in which they found the successive method produced better results than the simultaneous method. The implications of this study touch upon so many fields, for example, learning to play a piano or to write on a typewriter, that the reviewer should point out a considerable lack of agreement which still exists among the conclusions of various studies which are in the literature. Young (151) studied the comparative efficiency of varied and constant methods of sensori-motor learning. He found a superiority of 30 percent for the constant method as compared with the varied method in the groups of 162 subjects which he studied. He also found that a directed constant method was superior to an undirected constant method. The experiment had to do with such simple types of learning as ball tossing, quoits, and "gowf." Although the relative efficiency of varied and constant methods is a perennial one in educational discussions, the contributions of experimental studies to the solution of the problem would seem to be more promising if they dealt with the higher learning processes, which are more characteristic of typical situations to which such studies are applied.

Two reports deal with the part-whole method as applied to motor learning. Shay (134) made a brief report of the results of two groups of subjects in learning the "upstart on a horizontal bar," in which he found that the groups using the whole-learning method achieved superior results to the group using the part-learning method. Hanawalt (96), in using a maze experiment, also found the whole method superior to the part method or a modified part method. He observed that the patterns were easier to learn when they were kept unbroken, and then pointed out some of the causes why part methods are wasteful.

Two reports by Beebe (75, 76) dealt with the motor learning of young children. One of the studies was a very elaborate report of the effect of nutrition on motor ability, in which she found individual differences to be marked and highly variable. Other findings of the study were reported in detail. The report deserves careful reading by any who are interested in this problem. Her second study made an analysis of data from a controlled aiming test in which hand-eye coordinations were measured. Again she noted marked individual differences, and in general found that boys were superior to girls.

Memorization

In spite of the enormous number of studies of memory which have appeared in the literature, experimenters still find specific problems to investigate. Gordon (94) restudied the effect of practice in memorizing poetry, using ten sonnets in paired groups of five each. Her results were quite consistent in showing that the fifth trial was the best in the series, but from the evidence at hand she was not able to say whether this was due to possible differences in the difficulty of the material or whether it was due to position in the practice series. The fact that the improvement from Trial 1 to Trial 5 was fairly steady tended to show that position in the series is the primary factor. J. A. McGeoch (112) also observed that practice changes the percent learned in successive units of learning time. With unpracticed subjects and difficult materials he found that the curve of memorization tends to be *S* shaped. Mitchell (122) studied the presumed warming up effect in memorization. Experimenting with two lists of ten three-place numbers he found no reliable quantitative differences between number of trials or number of errors in learning the two lists consecutively, and concluded that there is no conspicuous warming up effect. In a second report the same writer (123) concluded that the effect of primacy is much more widespread and definite than the effect of finality. In still a third study, Mitchell (124) found that in memorizing three-place numbers the most frequent error was to give no response, the next frequent to give a three-digit response, with errors of one and two digits respectively appearing least commonly.

Ross (132) reported a study dealing with the technic of experimentation in which he showed the optimum order for the presentation of pairs in the method of paired comparisons. Persons who are setting up experiments of this type will find Ross' study worth careful reading.

Studies Using Mazes of Various Types

Ten studies relating to the various aspects of memory were carried on through the use of some type of maze situation. While many of the maze situations are subject to the same types of criticism which have been brought against the use of nonsense syllables, nevertheless, the susceptibility of maze situations to specific control makes them very useful for studying certain types of learning problems. The kinesthetic cues in learning a maze

have frequently been described as the outstanding factor in the process. Chase (82) took exception to this view and proposed that maze learning is chiefly ideational rather than kinesthetic motor learning. Insight comes gradually as the maze pattern is grasped and is coordinated in some symbolic manner by the mind. Students of psychology who are interested in the concepts of insight will doubtless find that the maze furnishes a flexible technic for their purpose.

Kellogg and White (102) employed a stylus maze to test Dunlap's theory of learning. They used seventy-five adult subjects divided into three groups. One group used the ordinary method of trial and error in learning the maze; a second group followed the method of repeating blind alleys as a test of Dunlap's Beta hypothesis; while a third group was used as a control. They found some support of Dunlap's theory as far as it relates to frequency and exercise. McKinney (117) reported a study of the retention of interrupted learning activities, using data from learning stylus mazes. He tested the hypothesis that interruption of a task before its mastery leads to better retention than non-interruption. Experimenting with both maze and verbal learning McKinney found some beneficial effects of interruption, particularly where the interruption comes near to the end of the task which is being learned. His findings have a relation to the distribution of practice which should be studied by persons preparing drill and practice materials in any field.

An extensive study of the relationship between anticipation and erroneous responses was reported by Lumley (107). He used evidence from finger mazes and also tested pupils in anticipation of numbers in a radio speech. He found that pupils' memory for numbers given in a radio talk was in accordance with the anticipation generalization. The study contained some significant implications for methods of teaching. Smith (136) presented a brief report of a maze experiment, using forty subjects, in which he showed the values of specific cues in maze learning.

An elaborate study of the behavior of young children in body mazes was reported by Wenger (148) in which different maze patterns were used. Above a necessary age minimum he found neither mental nor chronological age to be a factor in determining rapidity of learning in the types of maze situations employed. Individual differences in motivating conditions were considered of great importance. The study is a good example both of a careful experimental technic and of good scientific analysis and evaluation of a large body of data. Duncan (85) reported a comparative study of learning a finger maze by blind and sighted subjects. She found that the blind group made more errors and that the sighted group had a wider range of performance. The blind group experienced greater difficulties in the early part of the learning but found them easier during the later trials. Thurstone (143) developed a quantitative method to use in analyzing maze performances so as to reveal functional continuities that are not ordinarily revealed by the customary methods of analyzing maze data. The statistical technic proposed was described in some detail. Wagner (146) reported a

study to demonstrate the number maze as a useful technic for the study of the nature of learning.

While few of the maze experiments deal with situations which are typical of those found in school, they possess a value for the educational psychologist in that they aid in analyzing and abstracting certain elements of learning which should be restudied in typical school situations.

Forming Concepts, Problem Solving, and Insight

An interesting study of the value of positive and negative instances in learning new concepts was reported by Smoke (138). In describing the characteristics of a sedan automobile a positive method would be to point out that this car is a sedan and has these and these characteristics, whereas a negative method would be to point to cars which are not sedans and describe their characteristics. The study reported dealt with both the time of learning the new concept and the accuracy of the concept once learned. The investigator found no statistically significant difference in the time of learning by either method, but found that negative instances do improve the accuracy of the concepts which are formed. He also reported that most subjects preferred to learn by both positive and negative instances. The report dealt with a problem which has been studied so much less than the topic of memory, reviewed in the last two sections, that it would seem to furnish a profitable field for more frequent investigation. Furthermore, the problem occurs as such in most typical school situations, and is significant at all levels of education.

A study of the application of two divergent theories of learning was reported by McConnell (108) using arithmetic as the medium for study. A comparison was made of the learning of two groups of pupils, one of which follows the theories of the connectionist, whereas the other follows the theories of the Gestaltist. The data show that the connectionist group is superior in immediate and automatic responses, whereas the Gestaltist group is superior in the transfer of training and in manipulating the number facts learned in mature ways. The problem involved in the study is significant and the hypothesis presented should be tested in other school situations in subsequent studies.

Morgan (126) reported the characteristics of problem-solving behavior of adults. His data were drawn from three sources: a puzzle experiment and two experiments making use of mental mazes. Another study of problem solving was reported by Hartmann (97) who analyzed the factors involved in "insightful learning" and compared them with factors found in the trial-and-error learning in the solution of problems. Data were drawn from a series of tests of various forms. Different varieties of insight were identified, such as immediate, gradual, partial, complete, and sudden. The results indicated that insight learning is present as an end product of trial-and-error activity, and that an act is learned only when insight has been achieved. The study was limited by the difficulty involved in giving any

adequate and satisfying definition of the concept "insight" and in relating it to the terminology which was common before this word was introduced in its technical sense. Another study involving the role of insight in analytical thinking was reported by Henry (99). Thirty-two high-school students solved 9 originals and 14 theorems in geometry, and their reactions were studied to test the operation of insight. Insight as defined by the author was found in certain instances of solving geometric originals, although he reported that this does not characterize the typical behavior of successful students. A bibliography of twenty-eight articles is appended to the study.

Alteneder (73) proposed the use of jig-saw puzzles as useful material for classroom demonstration to show the various characteristics of the learning curve and also to show fluctuations in efficiency, the effect of physiological limits, plateaus, etc. The learning curves reported in his study were negatively accelerated.

Two studies were reported which have to do with learning in college classes. Welborn (147) reported a series of measurements made of the retention of meaningful material by recognition-type tests, showing results which emphasized the use of meaningful material. Cooke (83) reported two experiments in learning educational statistics from which he concluded that an equal distribution of the students' time should be given to working problems and to reading statistical literature.

Retention, Recall, and Forgetting

A considerable group of studies was found dealing with the conditions concerning the permanence of learning. Kolberg (103) reported a test given to 236 pupils in May and again in September to measure the amount of forgetting which occurred during the summer vacation. For easy material he found that improvement rather than forgetting takes place during the summer. For the difficult materials the amount of forgetting was roughly proportional to the degree of difficulty. He found no relationship between intelligence and retention, except that difficult materials were retained better by pupils having I.Q.'s above 120 than by pupils having I.Q.'s at the low 90's. In another study the investigators (89) reported a series of eight experiments with something over 1500 college students, using meaningful prose. They found the paradoxical situation of a progressive increase in recognition scores over a two-month interval, without practice. Furthermore, they found little relationship between this type of negative forgetting and the degree of mastery of the subjectmatter learned. Easley (87) reported an analysis of the curves of learning and forgetting code material, and showed that learning and forgetting curves of the traditional type may not accurately represent the true process of learning and forgetting.

A study reported briefly by Tyler (145) showed that the learning of scientific principles and their applications is more permanent than the learning of information and technical terms. The data for this study were drawn from 82 college students in classes in zoology. Although the study

was brief it dealt with an extremely important problem, and its implications have a marked significance for the curriculum maker. Eurich (90) reported a study of the retention of knowledge acquired in a course in general psychology, using a new type test of 150 items. He found that after a nine-month interval the median score on a general psychology test was at the third percentile, as compared with a test of the same group at the end of the course. It is to be regretted that the study did not make possible the type of comparison reported by Tyler (145). Bedell (74) reported a study of the relationship between the ability to recall and the ability to infer in specific learning situations. He concluded that the ability to recall specific facts and the ability to infer a generalized idea from these facts were different abilities. The low I.Q. subjects, that is, those in the lower fourth of the group, had greater difficulty in inferring than had the brighter members of the group.

Four studies by J. A. McGeoch, and J. A. McGeoch and McKinney (114, 115, 116) deal with the general problem of retroactive inhibition in learning. They considered that forgetting is, to a large extent, the function of the events interpolated between learning and the measurements of retention. In view of the fact that the permanence of learning is so often considered purely in terms of the materials learned rather than in the subsequent learning experiences, this group of studies is of a good deal of importance to the school. Another study dealing with the same problem was reported by Gibson and Gibson (93) in which they showed that the interpolation of a task similar to the primary learning either in operation or in material results in poorer retention than does the interpolation of a task similar in neither operation nor material. Considerations of this sort have received entirely too little attention in relation to the organization of curriculum material and the programming of pupil activities. Two studies of reminiscence by G. O. McGeoch (109, 110) showed that reminiscence, which is the improvement in memory after an interval of time without intervenient formal review or relearning, occurs independently of casual revival or intentional review. This phenomenon of reminiscence is another factor conditioning permanence which has received little consideration in methods of teaching at the present time.

General Factors Which Condition Learning

A miscellaneous group of studies is reviewed in this section of the chapter. In the main there is little excuse for grouping them together except to say that they do not fit in conveniently in the previous sections.

Educators who trust greatly to the efficacy of drill have fared badly at the hands of investigators during the last three years. Numerous studies have shown the inadequacy of sheer repetition. Thorndike (139) reported a study of the changes in the relative frequency with which letters are given in response to words, where the letters are neither right nor wrong. From the data in the study he (139:428) generalized as follows: "When any one

connection is as satisfactory as any other the brain's choice amongst them depends upon causes about which little is known, because such studies have been so little studied. . . . Two things we know about them. They are sensitive and shift notably; their shifts are not in the direction of strengthening the more frequent or strong at the expense of the less frequent or weak." In another study Thorndike (142) found the law of effect much more important than sheer repetition, while in a third study (140) he pointed out as a basal fact in mental dynamics that the last of two different connections made with a situation is stronger regardless of what happens before or after to that situation.

Siipola and Israel (135) reported a significant study related to habit interference in which they showed that when two incompatible habits are learned successively, so that interference appears in the learning of the second habit, there is in the initial stages of training an inverse relationship between the amount of interference and the stage of previous training, whereas in the advanced stages of training the relationship is positive. Maslow (118) reported a body of data on the effect of varying time intervals between acts of learning where the learning consisted of mastering one hundred lists of nine meaningful terms. He found mutual interference as well as retroactive inhibition. Short rest periods between practices were beneficial. Lepley (106) studied a factor in incidental learning by measuring in two large classes the amount of retention of names in the roll call. He found that retention was decidedly greater for names preceding and following the student's own name with somewhat higher scores for those preceding than for those following. Although the study is simple there are some rather interesting implications involved in the findings.

Carter (80), in studying errors in learning in the sixth and seventh grades, found a tendency for children to replace correct unpleasant words with incorrect pleasant ones. Factors of this type have received relatively little emphasis up to the present time in studies of learning, but they are doubtless important elements in many school situations. Emmons (88) studied the relationship between self-assurance and skill in a group of sixteen young children. She found a positive relationship between self-assurance and skill, and that both increase with chronological age. She found also that self-assurance varied directly with intelligence, although the measure of self-assurance consisted of a subjective rating and is open to some question. Betts (77) has made a rather extensive study of time limits versus work limits in learning. He found that the time-limit method produced more errors than the work-limit method. However, other factors of learning seemed to be more significant than either of these two. He found that the work-limit method was of greater value in raising the rank of an individual and in decreasing individual differences.

Reviews of Learning with Bibliographies

Three reports consisted primarily in critical reviews of studies of learning and contained sufficient bibliographies to be of considerable interest

to the general student of learning. J. A. McGeoch (113) wrote an extensive critical article dealing with the learning and retention of verbal materials, to which he appended a bibliography of 244 titles. The reference affords an excellent guide for a general survey of this field. Peterson (129) presented a critical article on certain aspects of learning to which a bibliography of one hundred titles is appended. A third general review (128), somewhat more limited in scope, dealt with a critical evaluation of forty-eight experiments on transfer of training. In this article the authors found that they can consider only six of the forty-eight studies as valid, with four more as of possible validity. The reference will supply a useful background for students in educational psychology who wish to become acquainted with the significant experiments in the literature of transfer.

CHAPTER III

Motivation, Emotional Responses, Maturation, Intelligence, and Individual Differences

Effect of Motivation on Learning

MOTIVATION, as used in many of the studies reported here, is rather an inclusive term. It includes those factors which in an individual and in the situation determine the nature of his acts. For this reason, reward and punishment, annoyance, knowledge of results, and purposing are classified as belonging to the general term "motivation."

There seems to be no doubt, at least judging by the number of studies reported, that the law of effect as stated by Thorndike has caused more controversy and more experimentation during the last three years than any other question of motivation. At least thirty-nine different articles dealing with rewards and punishment, all reporting one or more experiments have been published. The results of the experiments are conflicting, although there is a great deal of evidence showing that rewards have a beneficial effect on learning. The degree of benefit received from reward varies with the type and amount of rewards given. The effect of punishment is more doubtful.

Brenner (156) described an experiment in which he used 403 pupils of twelve third-grade classes. The classes were divided into the following six groups: immediate praise, immediate control, immediate blame, delayed praise, delayed control, and delayed blame. The groups were matched by average chronological age, I.Q., and initial spelling tests. The learning task consisted of learning eighty words from the Ayres Measuring Ability in Spelling. The examiner praised the work or blamed the pupils or said nothing as the case might be after the pupils had taken spelling tests. The author concluded that immediate praise tends to be more effective than delayed praise and immediate blame and delayed blame tend to be equally effective. No difference statistically significant was found between the recall performance of the different groups.

Crafts and Gilbert (160), in an experiment with one hundred college students divided into two groups with twenty-five men and twenty-five women each, found that punishment for error was advantageous, not only for the learning of a maze but also for retention of learning. Gilbert and Crafts (168) reported another study, the aim of which was to determine the effect upon the learning and retention of a stylus maze of giving an auditory signal for error during the learning. The experimental group, after a week, were markedly superior in recall, in relearning, and in percent saved on the number of per trial errors.

Guthrie (172) concluded from a study on reward and punishment that stimuli acting at the time of satisfaction or annoyance tend to reexcite whatever behavior was in evidence at the time. Muenzinger (194) reported on the effect of motivation in learning with three groups of white rats. In the first experiment the rats formed a black and white discrimination habit. The first group of rats was shocked in the correct alley, the second group was shocked in the wrong alley, and the third group was not shocked at all. The "no shock" group was definitely inferior to either of the other two. The "shock wrong" group was slightly better than the "shock right" group. His results contradict rather flatly that part of the law of effect which deals with the after-effects of annoyers. In another experiment, Muenzinger (195) tried to discover the function of punishment in learning upon college students. No significant differences were found between the groups that received an electric shock and those that did not. The same conclusions were reached whether the shocks were for right or for wrong responses.

After an experiment with white rats, Ni (196) presented data to show that the punishment for errors in learning to run a maze increased the efficiency in both learning and relearning. Ni (197) repeated his experiment using two groups of white rats, one of which was punished and the other was not. The punishment for errors during the learning of the first maze had not only a beneficial effect on the learning but also had a beneficial effect upon the mastery of a second maze.

Stephens (217) stated that the results of his study indicate that reward strengthens and punishment weakens connections even with initially weak connections. In another study with college students as the subjects, Stephens (218) found that punishment has no uniform stamping-in influence but that its effects vary with the conditions. "When conveyed by flashing lights, punishment stamps-in. When conveyed by a spoken word, punishment stamps-out. When a signal carrying no information of success is given, it has a decided stamping-in effect. When the same signal tells when the subject is right, strengthening is enhanced. When the same signal tells the subject that he is wrong, the strengthening is diminished." The author concluded that punishment and reward seem to have distinctly opposite effects, "if not equal."

Garrison (167) reported that there is a close relation between motivation and learning. He stated that interest, knowledge of progress, praise and reproof, and competition are important factors in motivation.

Crafts and Gilbert (159) presented data to show that knowledge of results on maze learning and retention has no significant effect. Thorndike (225), in an experiment with nineteen college students as subjects, came to the conclusion that the effect of relevant reward in general is not great. However, he found that money reward is effective. His evidence favored the decision that a satisfying after-effect strengthens somewhat the connection to which it is attached, even though it is irrelevant to the purpose in the interest of which the connection was made and highly incongruous with the cravings and expectations of the person at the time. Thorndike (220) reported

another study on the direct action of rewards upon mental connections and their indirect action versus the stimulation of inner equivalents of the connections. Human adults were used as subjects. Results indicated a small and unreliable advantage from inner repetition for multiple response situation.

The amount of strengthening that can be attributed to inner repetition is perhaps ten percent. The strengthening by the attachment of the satisfying after-effect in multiple choice experiments in which a new situation follows very soon after the after-effect of the previous connection is almost exclusively due to direct action on the connection, not to the incitement of an inner repetition to it.

Regarding the influence of punishment, Thorndike with Lorge, Tuckman, Stephens, and Rock, after several experiments, concluded that in multiple choice learning by human subjects where the situation vanishes immediately after the choice, is replaced by another, and recurs only after intervals of fifty to two hundred seconds filled by other situations and responses, a connection punished by the announcement of "wrong," or "wrong" plus one or more electric shocks, or "wrong" plus a money fine is strengthened by the occurrence in spite of the annoying after-effect (228:72).

Similar results were found by Rock (208) in a word learning experiment in which fifty educated adults and seventy-five children twelve and thirteen years of age in grades six, seven, and eight participated. In an experiment in which ball-tossing was the task, 125 educated adults were the subjects. For the children at least, the mere satisfaction at success in these tasks was small in comparison with the satisfaction at even the smallest money reward and the increments of satisfaction with increases in the money reward were presumably large. Rock stated that neither the addition of a money reward nor the increase in its amount causes a demonstrably greater strengthening over that found by the mere announcement of "right."

Thorndike and Forlano (223) reported on five experiments. In each experiment there were ten subjects, all boys, ten to eleven years of age. Although money was used as the reward for improvement and the reward was increased with the number of trials, the authors concluded that the increase of money seems not beneficial. In a second experiment with new subjects where smaller amounts of money were given as rewards, the gains were smaller. In their conclusion they stated, "We can then be fairly certain that the increases of the money part of the reward acts to increase the rate of learning up to 0.4¢ but the increase to 0.8¢ seems to do as much or more harm as it does good by arousing and maintaining attention to the work, satisfaction at success, and the like." They added, however, that the evidence is not conclusive.

Eisenson (165), in an experiment with 120 college students, found evidence to support the work of Thorndike and Lorge, namely, that multiple choice learning is a function of rewards and not of punishment. Irwin and others (177) repeated Thorndike and Rock's experiment trying to control additional factors which in their opinion afford no evidence of learning without knowledge.

Jensen (178) studied the effect of punishment by electric shock on performance. Fifty-five college students were selected as subjects. Eleven pairs

of students learned a maze. With each error an electric shock was given. Eleven other pairs learned without the electric shock. They discovered that the control groups did better than the experimental groups. In fact, the control group learned the maze in 14.64 trials, while the experimental group required 19.59 trials.

Many current articles are critical statements and reviews of other published articles. Waters (230) reviewed seventy-three articles which criticize Thorndike's original statement of the law of effect. Stephens (216) presented a theoretical discussion of the need for change in the interpretation of the law of effect, and H. E. Jones (179) studied the laws of emphasis and effect in children's learning. He described three experimental situations which were used to test trial-and-error conditions. The subjects were 150 junior high-school pupils. He concluded that laws of emphasis and effect are inadequate in explaining trial-and-error learning in the experimental conditions used.

Gilliland (169) reported that in an experiment with rats in which such factors as primacy, recency, and intensity were held constant, the law of effect *is* a factor in learning. The rats learned to go where they were fed, but they learned more slowly than in regular maze running. Gulliksen (171) developed an equation of the learning curve based on Thorndike's law of effect which gives the relation between cumulative errors and cumulative correct responses. He presented only theoretical data to show how the equation is used. Gray (170) gave a preliminary report of the effect of fatigue on learning and the selection and consumption of food materials. The report appears to offer many interesting suggestions for an experimental set-up, but no results were given.

Effect of Knowledge of Results on Learning

Several studies have been made to determine the effect of knowledge of achievement upon learning, only three of which are given here. Ross (209), in an experiment with 467 college students in which he gave full knowledge, partial knowledge, vague knowledge, and no knowledge of their results on a series of tests, concluded that a knowledge of progress such as is afforded by students seeing their test papers or hearing their test scores need not be a factor of practical significance in the ordinary classroom situation in college. Smith (213) described an experiment in which students estimate the length of a line without knowledge of the results. He gave no data. Waters (231), after having students judge the length of strips of cardboard, concluded that there is no relation between improvement and degree of information given. In another experiment he found that the improvement is roughly proportional to the degree of information given. He concluded that knowledge of results helps in complex learning tasks but is of little help in the simple learning tasks.

Other Types of Motivation

Drever (162) described an experiment with a series of geometrical diagrams some of which had a certain feature in common. He found that

insight into the nature of the common feature developed gradually rather than suddenly. Keys (181, 182), Meyer (193), and Remmers (206) studied the effect of tests on learning. Keys (182), in an experiment to study the influence on learning and retention of weekly as opposed to monthly tests, found that retention is 7 percent superior when tests are administered without warning from five to thirteen weeks after the corresponding periodic tests. Keys (181) also presented data to show the influence of true-false items on specific learning. The tests were given to 286 students in educational psychology five weeks after the completion of the subject.

Rankin (204) called attention to four community factors that affect learning. These factors were (a) the public agencies, (b) the private commercial agencies, (c) the organizations in the community that affect learning more or less directly, and (d) the characteristics of the neighborhood.

Hansen (174), in attempting to find the effect of motion pictures upon the retention of informational learning, selected pupils in grades seven, eight, and nine as subjects. Eighty-two pairs matched by intelligence and previous knowledge of the subject were used. The results showed that the pupils using motion pictures surpassed the control group by 12.1 percent and by 17.5 percent on the permanency of learning. He concluded that motion pictures are an aid to learning and that knowledge gained by pictures is fully as permanent in its nature as that gained through reading and oral presentation.

Effect of Emotional Responses on Learning

No less than eleven studies and several more individual experiments have been made to determine the effect of emotional responses on learning. In general, it would seem that pleasant experiences, and the arousal of pleasurable emotions are more conducive to learning than unpleasant experiences or the arousal of unpleasant emotions. Olson (198) called attention to the need for considering the emotional behavior of children in the school program. Moreover, there is some evidence to show that the act of learning is, itself, accompanied by an emotional reaction. Baker (152) found evidence that pulse and breathing rates increased over the normal, while the subject was attempting to learn. There was generally an increase in the amount learned when an artificial change in pulse occurred as a result of stimulation.

Carter and H. E. Jones (158) studied the response to pleasant, unpleasant, and indifferent words. They found that the words were learned most efficiently in the order just given. The differences in the results were statistically reliable. Although the retention of the learning is the same, the difference between the retention of unpleasant and indifferent words is not reliable. Carter, H. E. Jones, and Shock (157) reported another study of 102 children in grades six and seven. The task was the learning of a list of words classified as pleasant, unpleasant, and indifferent. The ease of learning correlated .40 with estimated pleasantness, .49 with galvanometric

deflections, and .65 with an emotional indifference. The learning scores of individuals were highest for pleasant words, next for unpleasant words, and lowest for indifferent words. In this experiment the group differences between any two of the three categories were statistically reliable.

White and Ratcliff (233) reported three experiments to determine the memory value of pleasant and unpleasant words. The results of these three experiments, in which the subjects were 150 students in psychology, support a theory of active forgetting. In the first experiment practically no difference was found between pleasant and unpleasant words in the ease of learning. In the other two experiments a difference was found. More pleasant than unpleasant words were remembered in delayed recall in every experiment. The longer the time interval the greater the superiority of the pleasant words over the unpleasant words. Eisenson (165) also found that a pleasant word generally caused a higher percent of repetition than an unpleasant word but slightly less than an indifferent word. The differences, however, were not statistically reliable.

Whitely and Blankfort (234) studied the influence of certain prior conditions on learning. In one experiment three kinds of learning material were employed, letter-digit substitution, poetry, and monosyllabic words. In another experiment three types of words were utilized which differed in each instance with regard to affective tone, namely, suffering and dejection, joy or hilarity, and neutral. They came to the conclusion that when using a story as a means of arousing a set of joy or sorrow, the best learning is obtained under the normal condition for the three kinds of learning material. With reference to the utilization of pictures as a means to arousing an emotional set, the total scores revealed no significant differences for the three conditions of learning.

Patrick (200) attempted to find the influence that certain emotional stimuli have on the types of reaction made by normal human adults—college students. The emotional stimuli consisted of pain by means of electric shock, cold shower, and blast of a horn. The results revealed a marked reduction in efficiency in the quality of types of reaction tendencies made by these adults while operating under the influence of emotional stimuli. McKinney (192) reported a study of 135 college students divided into three groups who learned a maze and a list of twelve nonsense syllables, performed a motor task, and solved a group of multiplication problems. While one group went through these tasks, an automatic clock buzzed each minute. In another group, in addition to the above set-up, the subjects were told that the average person could do the task in six minutes and at the end of that time an automatic interval timer rang. The third group worked under normal laboratory conditions. Errors in the task increased greatly with the introduction of the clock ringing each minute and increased more with the suggestion of intellectual inferiority. Time and trials were affected in both directions and both tended to increase. There was a noticeable change in the expressed attitude of the subjects as well as a change in social behavior and steadiness of movement due to the experi-

mental conditions. The results evince that emotion affects learning and that a strong emotion cannot act as a motive in an intellectual task or a skill.

Whitely (235) reported four different experiments concerning the influence of music upon learning. In one experiment the subjects learned joy and sorrow words with music as a prior condition. In the second experiment monosyllabic words were learned with music as context during the learning period. In the third experiment, monosyllabic words were learned and after an interval of fifteen minutes recalled and relearned by the anticipation method. Four different types of music were employed in this experiment. The results showed that both fast and slow music exert a slight detrimental influence upon learning. When memorization is accomplished by the anticipation method, the fewest number of trials are needed with slow music and the greatest number of trials under the song condition. Recall scores fifteen minutes after the learning do not reveal any significant differences although the song condition appears to be best for retention. In the memorization of poetry the results indicated clearly the superiority of the normal condition over the two musical conditions "Largo" and "The Storm." Least returns were obtained when music of a tempestuous character served as context.

Zyve and Smith (238) studied the effect of radio music accompaniment on accomplishment in school work. They concluded that there was no significant difference in the results of tests taken normally and those accompanied by jazz instrumental music. In fact, they found no evidence to show that the playing of music in the home while pupils were studying either helped or hindered their learning.

Hartmann and Hamm (176) reported an interesting device to find the proportions of a course which students in educational psychology were interested in and which parts affected them pleasurably.

Effect of Maturation on Learning

The relation of maturity, in terms of chronological age, to learning is reported in fourteen studies. These studies deal with all age levels of humans. More studies of infants are reported than of any other group. Wenger and Williams (232) reviewed ninety-nine studies of learning in infants and preschool children. The authors summarized the studies as follows:

> The work on learning is similar in many respects to experimentation in child psychology as a whole. . . . There has been an increasing use of controls important in studies of learning in rapidly growing organisms. Interest has shifted from the try-out of techniques and the achievement type of research to more analytical studies of the learning process. The more refined researches thus far, however, may be characterized as being samples of many types of problems rather than as units in an integrated program.

Halverson (173) studied eight infants at lunar month intervals. Motion picture records of the movements of the children were kept. He found three stages in the development of these infants. The first stage consisted of simple

sensory motor responses, the second stage consisted of voluntary movements reaching from crude groping to direct reaching, and the third stage was largely automatic. Reaching began at twelve to twenty weeks, was discontinuous and jerky. From twenty to sixty weeks the movements became more continuous.

Bayley (154) studied sixty-one infants at regular intervals from birth to thirty-six months. He found that gross motor coordinations mature more rapidly than mental functions during the first two years, while after two years motor progress is comparatively slower. There was less consistency in motor development made by the same child over different age levels than was found on mental series. The coefficient of correlation between mental and motor scores after two years was .50, while no relation was found between the motor test scores and parents' education.

Roberts (207) studied twenty-one four-year-old children enrolled in the preschool laboratories of the Iowa Child Welfare Research Station and nineteen children from four to seven years of age in the Iowa Soldiers' Orphans' Home. Learning ability was more closely related to mental age than to chronological age. According to this study, children's responses to direct questioning may or may not yield reliable information concerning their ability to solve problems. Failure to respond verbally should not be taken as inability to respond, nor should failure to verbalize in a learning or problem-solving situation be considered as indicative of inferior ability in learning or problem solving of the type represented by this experiment. A child may give no evidence of ability to generalize verbally, whereas his performance in problem situations may show that he can generalize correctly.

Bathhurst (153) found a constant increase in reaction time and muscular coordination with advancing chronological age from six to eighteen years inclusive. Langhorne (184) studied seventy-six children whose ages varied from seven to seventeen. These children were trained to operate the Wrenshaw Pursuitmeter. Each child ran thirty-six cycles of four minutes each during eighteen consecutive days. He found that the limit and rate of improvement from practice increased directly with age. Maximum acceleration in improvement appeared about the beginning in the age of adolescence (thirteen to fourteen years). Sorenson and Price (214) arrived at the conclusion that adults have by no means lost their ability to learn.

At least one study has been made to show the relation of chronological age to achievement in subjectmatter. Finch and Floyd (166) reported a study of 147 pupils ranging in chronological age from eleven to nineteen years who were studying French. The pupils were equated on intelligence quotient obtained from an average of five group intelligence tests. The achievement was measured by American Council Alpha Foreign Test. The results showed a correlation of .10 between age and achievement for the vocabulary part of the test and .12 for the grammar part. When intelligence was partialed out, the relationship was raised to .27 for vocabulary and reduced to .09 for grammar. There seems to be no evidence in this study

to indicate that French should be reserved to senior high schools or that pupils in grades seven and eight are too young to begin the study.

In another study on the effect of age differences Langhorne (185) drew the following conclusions: (a) rates and limits of improvement from practice increase with an increase in chronological age; (b) the period of greatest improvement appears during or near the beginning of the adolescent period; (c) the subjects seemed to fall into age groups separated from each other by different intervals; and (d) an increase in age does not bring a conflict between the various manipulatory responses involved in the acquisition of this skill.

Ruch (210) studied the effect of learning motor tasks and verbal tasks at three different age levels. Forty persons divided into three groups were studied. The subjects in the first group were twelve to seventeen years of age, in the second group thirty-four to fifty-nine years of age, and in the third group sixty to eighty-two years of age. The motor tasks showed the greater deficit of the aged as compared with the younger learners. The verbal learning tasks showed the amount of deficit increased in the following order of learning skills, paired associates, nonsense materials, and false products. The differences between the aged and the other two groups were statistically significant. The results between the young and the middle age groups fluctuated so that no specific conclusions regarding the superiority of one group over the other could be drawn.

Stroud and Maul (219) studied 226 subjects from grades two through six and grade nine and from college, who were tested on the memorizing of three poems and six lists of nonsense syllables. The learning scores increased with age, but chronological age was found to be less important than mental age. No consistent relation appeared between age and retention. Cruze (161), in an extensive laboratory experiment with chicks, studied the effect of practice at different levels of maturity in picking and swallowing reactions.

Effect of Intelligence on Learning

Relatively few studies have been made in the last three years to determine the effect of intelligence on learning. Eckert (164) reported in a study of superior and inferior college students that reliable differences were found in their success in college English and social studies, New York State Regents Examinations, total freshman-sophomore college average, and high-school English, social studies, and Latin. Thorndike and Woodyard (226) reported a series of experiments related to intelligence and learning. They concluded that there is little or no fundamental depression of the intellectual apparatus by work with infrequent success for which a suitable voluntary control cannot compensate. Frequent frustration caused irritation and loss of interest but not any large loss in power to attend to frustrating tasks. Bathhurst (153) reported a low positive correlation between abstract intelligence and scores to measure muscular reaction.

Effect of Sex and Individual Differences on Learning

Langhorne (185) found that boys learned to manipulate a machine more readily than did girls. Scott and Underwood (212) studied the effect of sex in learning a maze. Perl (201) studied the changes in individual differences in ninety-nine pupils, forty-six boys, and fifty-three girls in grade 4B. The pupils were matched by chronological age and intelligence. Four tasks were used in the study; namely, (a) making gates test, (b) Whipple's symbol-digit test, (c) Turkish-English vocabulary test, and (d) arithmetic test of a "peculiar type." She found that individual differences increase with practice in all the tests for both boys and girls when an increased sigma was used as the criterion of an increase in individual differences. The results tended to confirm the hypothesis that in simple tasks individual differences decrease with practice, while in the case of more complex tasks, they increase. Harter (175) found support for Snoddy's theory of learning as the capacity of neuromuscular patterns to endure stimulation.

Effect of Drugs on Learning

Two studies have been made to show the effect of drugs on learning. Omwake (199) reported a study of the effect of barbital, an effective sleep producing drug, on white rats. The barbital group was consistently less active than the control group. For five-minute periods the barbital group showed lower learning rate but for thirty-minute periods there was no significant difference in the two groups. J. R. Jones (180) studied the effects of aspirin and quinine upon the rate of learning twelve nonsense syllables of college students. The average number of trials for learning these syllables were for the aspirin group 10.48, for the quinine group 10.28, and for the control group 10.00. The differences were not statistically significant. The authors concluded that quinine and aspirin may be said to have a neutral effect on learning. The variations appeared to be due to chance. However, an early rise in the quinine curve may be due to action of quinine; but this, too, is probably a chance factor.

CHAPTER IV

Methods of Teaching

MUCH HAS BEEN WRITTEN about the difficulties of conducting research on methods of teaching. No one can review studies in this field without being impressed with the illusive nature of many of the factors which may influence the results of experimentation in this area. In any controlled experiment in methods of teaching, there are chance fluctuations in pupil-interest, pupil-industry, pupil-experimental background, pupil-teacher relationships which may affect growth in achievement in such a manner as to obscure differences in the relative effectiveness of different methods. The teacher's zeal in employing one of the two or more methods under investigation may be only partially controlled even when methods and teachers are rotated. For this reason the problem of measuring growth during the experimental period presents many difficulties. In practically all reported experiments, the conclusions are based on measurements of growth in terms of subjectmatter tests. As to the relative effect of different experimental methods upon pupils' concepts, attitudes, relationships with life situations, one may only speculate.

Since methods of teaching must be investigated in teaching situations closely resembling actual teaching, it has been quite impossible in this summary to avoid overlapping with those summaries of research which treat the teaching of special subjects, and to some extent with those which deal with the psychology of school subjects. Although the reviewer has made an attempt to focus attention in this section on "general method" rather than upon the different subject areas, it has been impossible to make a clean-cut separation. The studies in this section have been confined to the general areas of: remedial teaching, training in study, procedures using audio-visual aids, newer-type procedures, and special methods.

Remedial Teaching

Studies in this division are for the most part related to remedial teaching in reading, English composition and grammar (including correct usage), handwriting, and spelling.

The summaries of reading investigations by Gray (264, 265) and the contributions of research in the teaching of curriculum making in English by D. V. Smith (292) include additional materials on the problem of remedial teaching in the field of English.

Traxler (294, 296) reported a study made in the University of Chicago High School to determine the value of teaching corrective reading, to discover technics to be used in correcting reading defects, and to ascertain the permanence of gains made during the period of corrective teaching with

seventh- and ninth-grade pupils. The study was of three-year duration. During the first-year experimental period, both the seventh- and the ninth-grade remedial groups showed much greater growth in rate and comprehension than did the control groups. During the second year and during the third year of experimental teaching, the remedial groups made significant and substantial gains over the gains made by the control groups, and decidedly larger gains than the norms given by the publishers of the tests which were used. While some pupils showed losses when retested several months later, most of the backward readers derived considerable permanent benefit.

Gatto (259) reported the results of a remedial reading program in thirteen high schools in Pittsburgh in which use was made of factual material to insure transfer to the work of the regular classes. Persons (284) reported the procedure used in the Theodore Roosevelt High School, New York City. A three-week period was reserved in all freshman English classes for intensive work in reading. The results indicated that such a plan secures desirable returns.

Shuchowsky and Flemming (290) and Farbish (252) conducted studies with ninth-grade pupils and reported significant gains on the part of the remedial groups. Shuchowsky and Flemming used a composite of activities designed for improving ability in reading, while Farbish used only a series of lessons, each lesson consisting of a single paragraph with a number of questions on each paragraph.

Miller (279) tested the possibility of increasing comprehension of literature on the part of ninth- and twelfth-grade pupils by using short comprehension drills on literary materials. The technic proved effective. The ninth-grade pupils improved more than the twelfth-grade pupils and the plan was most effective for the poor and average readers.

Gibbs (260) used free reading as means of improving the reading ability of sophomores. Pupils selected their own books from a library of 45 books ranging in difficulty from the fifth-grade to the ninth-grade level, and the report indicated that a number of comprehension checks in the form of dramatizations, answering questions, making out test questions, and giving out sub-headings to selections were used. The Thorndike-McCall and the Monroe Reading Tests indicated a median improvement of 2.5 grades. Only two pupils failed to show real progress.

Hinchman (270) used remedial procedures in instructing a group of dull pupils in the ninth-grade level, in English. The twenty-five pupils in the group had a median I.Q. of eighty and came largely from foreign-born parents. Tests administered before and after the remedial program indicated an advance in median scores from sixth-grade to ninth-grade level of attainment. Parkhill (283) also reported improvement in reading with low-mentality groups on the seventh-grade level secured by using a variety of easy reading materials. Unfortunately neither Hinchman nor Parkhill used a control group.

Attempts to meet the needs of poor readers on the elementary-school level by carefully planned programs of remedial reading are well illus-

trated by Gates (257) in a report of a series of diagnostic and remedial studies carried on in New York City. The report described the effective work done with "non-readers" from grades two to four inclusive, in forty coaching days. Lamoreaux and others (273) reported successful work with sixth-grade groups.

Orr (282) reported a study conducted in two elementary schools of Atlanta, Georgia. Orr was interested in setting up a program of remedial teaching which might be carried along with regular class duties. The technics used for selecting and diagnosing pupil difficulties and for conducting remedial teaching were based largely on the procedures outlined by Monroe (281). Improvement was shown by practically all the children for whom records were kept. Because the results reported were based on a small number of cases, the outcomes of this study are not at all conclusive; but the problem is one of considerable interest to public school workers. MacLatchy and Beavers (277) reported a study which gave evidences of the effectiveness of reading for enjoyment as a means of improving the reading ability of sixth-grade children.

Studies of attempts to correct the difficulties of pupils in reading and to secure improvement in rate and comprehensions are encouraging in that they seem to indicate that whenever intelligent effort is directed toward securing improvement, such improvement is forthcoming.

Bonar (241) summarized nineteen studies relative to the comparative values of systematic and incidental training in reading and concluded that the evidence was decidedly on the side of systematic training. Bonar's conclusion seems to be sustained by the results obtained in the field of remedial instruction in reading. More studies on the permanence of the improvement secured in remedial classes as well as on the transfer of the improvement secured under various conditions to reading activities in other classes seem desirable.

The correction of errors in composition has received considerable attention. Guiler (267) reported a remedial project conducted with college students. The Guiler-Henry Diagnostic Test in Grammatical Usage was given to 346 students. The scores of these students ranged from zero to seventy-five. Those having scores below forty-three, 163 students, were selected for remedial work. The remedial work was organized on an individual and self-administering basis. The results showed a marked improvement in ability to apply principles of grammatical usage. The average student's score increased from 26.8 in the initial test to 8.4 in the final, or from less than eleventh-grade ability to a standard far above that attained by a typical college sophomore. Guiler suggested that because students manifested marked individuality in the types of errors made, individualized remedial instruction is advisable.

Another study by Guiler (266) conducted on the elementary-school level, showed clearly the possibility of improving pupil mastery of mechanical and usage skills in language through remedial instruction.

Warner and Guiler (298) studied the relative effectiveness of individualized remedial drill versus group instruction as a means of improving

grammatical usage with ninth- and tenth-grade students. Again the results indicated that individual instruction based on individual needs is much more effective than mass instruction.

Two methods of correcting eight errors in English, oral drill and grammar study, were investigated by Crawford and Roger (247) using two groups of seventh-grade children. The major feature in the oral approach was having the class read in concert a series of sentences containing the correct form of the error on which attention was being focused. The major feature of the grammatical approach was the explanation of the grammatical principle involved and the memorization of rules. Methods were rotated so that each group of pupils used both methods. The final test showed the two methods to be equally effective. No tests for permanency were given.

Ransom (287) investigated the value of having pupils carry on a semi-individualized type of practice to correct language errors. All drill in the experimental group was directed toward the elimination of sixteen types of errors made by the pupils. The experimental group made significantly greater progress in eliminating errors than did the control group.

Six methods of eliminating twenty selected errors in grammatical usage over a six-week period in thirteen classes in grades 5, 6, and 7, were investigated by Cutright (248). The rank order of the successful methods was: (a) choice of two forms followed by oral repetition of corrected sentences to accustom pupils to the *sound* of the correct forms; (b) combination of all methods, a different one each week; (c) the Beta-hypothesis procedure of practicing error rather than the correct form [better with older pupils than with younger]; (d) choice of two forms [same as (a) but without oral repetition]; (e) proofreading; and (f) language games.

One study of remedial teaching in fields closely related to English composition is that of Traxler and Anderson (295) in group corrective handwriting and group corrective spelling. Traxler and Anderson gave corrective instruction in handwriting to two groups of seventh- and eighth-grade students, sixty-nine pupils in all, whose handwriting scored below fifty in the Ayres Scales for Measuring Handwriting, Gettysburg Edition, for one period a week for eight weeks. At the end of the period of corrective teaching, the students in the corrective classes had lost slightly in average rate of writing while those in a control group had gained. These students in the corrective group made marked improvement in quality while those in the control made only a small gain. All groups were retested after the summer vacation and it was found that all groups had increased in mean rate and that there was only a small loss in quality by the corrective groups. The net gain of the corrective groups from February to October was approximately nine-tenths of a step on the Ayres Scale.

As a result of group corrective instruction in spelling Anderson and Traxler (239) reported that two groups of students, seventh- and eighth-grade level, made one year's growth in a period of thirteen weeks, with one class period a week devoted to class work. The gain in spelling ability was permanent. The corrective groups retained about 80 percent of the gain when they were retested after the summer vacation.

Studies of remedial and corrective teaching in general seem to indicate that whenever attention is focused on the learning difficulties of the individual child and some intelligent and systematic type of help is given, improvement is secured.

Study Habits

Studies of the value of special training in specific study habits are closely related to those reported in the section on corrective and remedial teaching. Three such studies were located in the literature. Jacobson (272) reported a series of studies on the effect of work-type reading exercises on the reading comprehension of pupils, on their achievement in general science, and on their general achievement in all academic subjects. The exercises proved to be more effective with poor initial readers than with good initial readers. The studies gave some evidence that reading instruction in the field in which content is to be mastered is superior to giving it in one subjectmatter field and expecting the ability to be transferred to another field.

Mills, Eckert, and Williams (280) evaluated a "How To Study" unit of instruction. Instruction in how to study took the form of lectures and discussions on the mechanics of reading, analysis of methods of deriving more meaning from the printed pages, extra vocabulary work, and the use of large number of exercises designed to increase speed and comprehension. After six weeks' training the experimental group was compared with a control group. The experimental group was superior in speed only and in a retest several months later even this advantage had disappeared. In comprehension the results favored the control group, but the difference was not significant.

A more encouraging report is that of Salisbury (289) who gave thirty special training lessons on outlining to secondary-school pupils who were matched with pupils in a control group on the basis of mental age and reading ability. The pupils in the control group studied English in the usual way. The results implied that definite training in outlining will secure decided improvement in reading and that such instruction measurably increases a child's chances for general school success. Likewise Leggitt (276) secured encouraging results by providing guidance in (a) becoming informed about a new book, (b) using a general reference book, (c) the reading of a newspaper, (d) interpreting a diagram or chart, a picture graph, or a statistical table, (e) summarizing, and (f) outlining.

Audio-Visual Aids

The effectiveness of audio-visual equipment as instructional aids is a comparatively new subject for experimental investigation. Clark (243) compared sound films with silent films as aids in teaching a survey course in science. Sound films were found to be as effective as the lecture demonstration and more effective than the silent films in arousing interest. Sound films were less effective than silent films in securing high scores on a com-

prehension test. Einbecker (251) conducted a somewhat unique study which compared the effects of various forms of verbal accompaniments to films. He compared the effect of silent films without captions or oral comments of any kind, silent films with oral comments by the teacher, and sound films. So far as science films are concerned, the results indicated that verbal accompaniments increased the comprehension over that secured from the film without captions or comments, but that it is immaterial whether it is the teacher or the speaker in a sound film who comments. Einbecker suggested that the function of verbal accompaniments to films is to furnish word symbols which may be used to represent the more concrete experiences which the films portray, and to direct attention to the important terms or features of the pictures. Rulon (288) compared three groups in general science; one group used the usual textbook method, another group used the textbook and a sound film, and a third group acted as a control. The groups were carefully equated. On an information test the film group exceeded the control group by 20.5 percent more than the textbook group exceeded the control group. Sound films according to this study furnish much supplemental information.

Arnspiger (240) measured the effectiveness of carefully prepared sound film units as compared with traditional methods in teaching natural science and music. This controlled experiment was carried on in five cities in the same geographic area using fifth- and seventh-grade pupils. The investigator concluded: (a) the superiority of the sound picture method (as used in the study) was 26 percent in the science group and 27 percent in the music group; (b) the average gain was 22 to 30 percent in the science group and 18 to 34 percent in the music group, using the sound pictures; (c) on the film unit items, all cities combined showed 50 percent superiority in science, and 31 percent in music for the sound pictures; (d) pupils, both below and above the average 1A, showed distinct learning gains from the use of the films; and (e) the average recall test gains over the initial test were greater for the experimental group. In natural science the percents of superiority ranged from 9 to 18; in music, from 14 to 32.

Only one study was located concerning the effectiveness of the radio as an instructional aid. This study was reported by Carpenter (242). He measured the factual knowledge in general science gained by radio instruction given to seventh-grade pupils. Twenty-five groups, each in a different school and without science equipment or trained science teachers, were compared with fourteen groups in schools with well-equipped science rooms and well-trained science teachers. The radio group was given thirty lessons by radio, two lessons a week. Each lesson consisted of a thirty-minute radio presentation and a twenty-minute follow-up period. Teachers of the radio groups were supplied with a brief outline of the work for each week along with directions for the follow-up period. Pupils took notes during the broadcast and at the end of the presentation were asked to select the most important thing and the most interesting fact given. Tests which were given at the

end of the experimental period and which were based on the syllabus used in the school system, showed the radio classes to have a higher percent of correctness in fifty-two of seventy questions than did the regular science groups. While the investigator did not feel that the study necessarily indicated that instruction by radio was superior to regular class instruction by trained teachers, still it does indicate a satisfactory means of giving science instruction to small, scattered classes where teachers trained in science are not available.

Newer-Type Procedures in Teaching

The educational outcomes in schools using the activity type of curriculum were reported by two investigators, Collings and Wrightstone. Collings (245) reported a study which compared the achievement of pupils in grades seven, eight, and nine in an "activity" school with pupils of the same grades in a "subject" school. Sixty-four pupils in an "activity" school were paired with 64 pupils in a "subject" school. The seventh-grade pupils in each school were then given a series of subjectmatter tests, 13 tests in all. These tests covered the fundamentals taught in the various subjects in the "subject" school. The eighth- and ninth-grade pupils were given the same battery of tests with a test in science added. In the seventh-grade groups, the average mean score was 4.7 higher for the "activity" group. The "activity" group excelled in 9 of the 13 tests. In the eighth grade, the average median score was 4.0 higher for the "activity" school and they excelled in 9 of the 14 tests. The average mean score for the ninth grade was 5.9 higher for the "activity" group. Collings concluded that the study indicated that pupils taught in a school where an activity curriculum prevailed did as well or better than did pupils in a school with the conventional subject curriculum.

Wrightstone (300) compared four communities with reference to the educational outcomes in schools using the newer type of curriculum and in standard type schools using the standard subject-centered type of curriculum. He used a matched-pair technic. The study was concerned with "areas of intellectual factors, with dynamic factors, and with social performance factors." The results were uniformly in favor of new-type procedures.

Many studies have as their subject the investigation of the relative effectiveness of a type of teaching which allows more pupil initiative and activity as contrasted with a type of teaching such as the textbook method which is usually very limiting to pupils' activity. Wrightstone (301) also reported a study which evaluated the more informal pupil-activity type of teaching with the conventional textbook and topical method of teaching American history. Groups of 30 pupils each were used. The groups were carefully equated in the basis of intelligence, socio-economic status, and phases of school experience. The experimental group approached their study of American history through problems chosen from current events which the teachers and pupils found in periodicals and newspapers. Each

pupil chose topics for investigation according to his interest. The teacher was guide and counselor to individuals and groups. There were discussions, and both oral and written reports. The conventional group used a textbook in the conventional manner.

At the end of the experimental period, both groups were given the Co-operative American History Test, Form 1933. The mean score of the experimental group was 96.9 and that of the textbook group was 88.6. This difference led Wrightstone to conclude that, in the teaching of the social studies, the "new" approach is just as effective as the conventional approach, if not more so. When the pupils were tested for liberal versus conservative civic attitudes and beliefs, it was found that the activities used in the experimental teaching were more effective than the conventional method in leading pupils to liberal points of view on civic problems.

Wrightstone (303) also investigated the new-type method of teaching mathematics as compared with the traditional method. The new-type method consisted of a fused course in which the various branches of mathematics were correlated with other courses such as the natural sciences and the social studies. The work was organized in units about such themes as "The Financial Relationships of Children to Parents." The subjects so taught were arithmetic, elementary algebra, intermediate algebra, and geometry in the seventh-, eighth-, ninth-, tenth-, and eleventh-grade levels. He reported that in arithmetic, elementary algebra, and plane geometry the classes taught by the newer-type method achieved better scores than did the classes taught according to the traditional method, but that the differences were statistically significant only in plane geometry. The conventional or traditional method was significantly superior in intermediate algebra.

Wrightstone (302) investigated the comparative value of the traditional separate subject plan of teaching of grammar, spelling, reading, composition, and literature versus the newer type of functional-individualized teaching, correlating all phases of English instruction with other departments to produce such projects as plays, newspapers, etc. He concluded that the newer or functional approach to the teaching of language arts produced equal or superior knowledge and skills according to the tests used in the experiment. In literary acquaintance, the activity method gave significantly superior results. The investigator suggested a more extensive study of the value of this new-type program in English.

Lee and Root (274) reported an experiment with a program which integrated the social studies, English, and art. The three subjects were taught separately to the control group and were integrated for the experimental group. In grade 7B, the results favored the integrated program, but in grades 7A and 8B the separate subjects seemed more effective. The authors concluded that the results varied directly with the personality, training, and adaptability of the teacher.

Hazelrigg (269) found that a group of pupils taught by the informal method in English composition showed a markedly greater reduction in the number of errors for each 100 words written than did another

group of pupils of like ability, taught by a formal method. Also the informal method seemed to stimulate pupils to write more than did the more formal method. Taggart and Haefner (293) reported on two methods used in teaching Macbeth. An experimental method in which the students led all the discussions and carried on other activities largely of their own selection, individually or in groups, was compared with a more traditional method of the teacher-question type. The pupils in the experimental group were slightly superior to those in the traditional method group in intelligence. At the end of the experimental period, the experimental group had less factual knowledge concerning the play, Macbeth, than did the traditional group. The results, however, were such that no significance could be attached to them.

Lee (275) evaluated an activity program in relation to learning to read by measuring the reading ability of first-grade children grouped according to the teacher's estimate of the amount of time given to "activity work" into groups doing "a great deal," doing "some activity," doing "very little," and doing "none." The tests indicated that pupils in schools doing a "great deal" of activity work had somewhat less ability in silent reading than had those children in schools doing somewhat less activity work. No particular significance can be attached to the results since teachers' estimates of how much activity work they were doing were no doubt somewhat unreliable.

Howell, Dunn, and Stoker (271) tested the efficiency of a plan of giving one hour a day to drill on skills not growing directly out of an integrated program. They used the Stanford Achievement Test in grades three to six inclusive to test the efficiency of the plan, and concluded that skills can be maintained in an integrated program when one hour a day is allotted to drill on skills not growing out of regular units of work. Spelling may be the one exception but the investigators questioned the extent to which the Stanford Achievement Test really measured the pupils' ability to spell the words which they were using.

Dransfield (250) made an investigation of the value of a method of meeting the needs of superior children within the limits of an ordinary classroom situation. His method was one of supplying superior children with self-administering instructional units. The pupils selected for this experiment had I.Q.'s of 110 or better, and E.Q.'s of 100 or better. They were located in nine schools, ranging from the rural to the junior high school, and in grades three, five, and seven. The experimental group was equated with a control group. The experimental group spent approximately 38 percent of their time working on their self-administering and self-checking units, while the control group continued their regular class work. The subjectmatter test used to measure pupil-growth during the experimental period favored the experimental group as did the subjective judgment of teachers.

Special Methods

Classroom teachers continue to be interested in special methods described by such terms as the contract method, the project method, the

Dalton laboratory method, etc. While none of these terms have definite connotations, still they indicate, in general, attempts to modify teaching methods in such a way as to furnish a greater challenge to pupil interest, to utilize more lifelike materials, and to permit more pupil activity.

C. G. Smith (291) investigated the relative merits of the project method and the traditional method of teaching senior high-school biology. He used four classes of equal ability for experimental teaching. A fifth group of pupils used the traditional method throughout the experiment. The work was divided into two units of eighteen days each. The first unit was presented in the traditional manner, two days of laboratory work and three days of recitation, to two classes while the other two classes had the same unit presented by a project method wherein the pupils worked individually or in groups on projects selected from a posted list or substituted with the teacher's permission. During the second unit the methods were reversed. Mimeographed objective tests were used to gauge improvement. Scores on the objective tests were 34.94 for the traditional method and 17.85 for the project method. Difference in skill in using the two methods may have influenced the results of Smith's experiment. Powers and Black (286) attempted to ascertain the measurable results of a panel discussion method of teaching the social studies as compared with the Morrison unit method. They used the three-group method for experimentation. Group A used the modified Morrison plan and acted as the control group, Group D used the panel plan, and Group C used the Morrison plan. The experiment ran for eight weeks. At the end of the first four weeks, the panel group and the Morrison group exchanged methods. Tests were given at the end of the first four weeks and at the end of eight weeks. On these tests, both at the end of the first four weeks and at the end of the second four-week period, the methods ranked in this order: (a) the group using the panel method, (b) the control group, and (c) the Morrison group. The authors concluded that the panel method of teaching social studies produced better results as measured by teacher-made objective tests than did the Morrison method; that the pupils in the panel group assimilated more facts and more understandings; that pupils of the lowest intelligence did as well by the panel method as by the Morrison method; that pupils of average or high intelligence did consistently better in the panel method than in the Morrison method. Studies by Fowler (253) and Gadske (254) gave results more favorable to attempts in vitalizing methods of teaching.

Macomber (278) compared the contract method and the discussion method for teaching the social studies in the seventh grade using the matched-pairs technic. The results in general favored the contract method, but the number of cases used were too few to permit the drawing of conclusions. Fowler (253) made an investigation comparing a laboratory or modified Dalton plan with the traditional plan of teaching history on the secondary-school level to discover which of the two methods caused the larger number of students to study history for "interest" rather than for "credit." The results indicated that the laboratory or modified Dalton plan

aroused the greater degree of desirable interest in history. Gadske (254) compared a "unit method" in which instruction was quite individualized, with the traditional recitation plan in the teaching of ninth-grade algebra using equated groups. The results were significantly in favor of the individualized unit method.

Peters (285) made a study which may well be included in this section on special methods. Teachers of foreign languages have long discussed the comparative value of the grammar translation method and the direct method of teaching a language. Peters compared the relative values of the two methods in the teaching of French, using a group of college freshmen. A group of students was divided into two sections, equated as to mental ability. One group was taught by the grammar translation method and the other by the direct method. The grammar translation method had the advantage of more concrete progress in the early stages of teaching, whereas the direct method students seemed to achieve more at the end of their first year. The advantages of the grammar translation method seemed to be: (a) it secures better results during the first semester; and (b) it secures better results in translation both in vocabulary and comprehension, as of written questions. The advantages of the direct method seemed to be: (a) it secures better results during the second semester; and (b) it secures better results in dictation, in reading, in pronunciation, aural comprehension, appreciation, and grammar. The number of cases used in Peters' study was far too small to permit the drawing of any hard and fast conclusions.

Drake (249) investigated the relative merits of an individual method and an individualized group method in the teaching of algebra. The pupils comprising the two were ninth-grade algebra classes, matched according to intelligence quotient, achievement during the first few weeks of school under the same method of instruction, results of a survey list, arithmetic achievement, and chronological age. Under the specific conditions of the experiment, these conclusions were reached:

> Students with superior ability attain a higher standard of achievement under the group method than under the individual method; the group method is also to be preferred for students with low ability. Both methods require about the same amount of outside preparation on the part of the students. Pupils taught under the individual method make slower progress than those taught under the group method. Pupils under the group method achieve consistently higher on tests throughout the year as well as on tests given at the end of the year.

The results of Drake's investigations are somewhat at a variance with other studies in the field of remedial teaching which indicate that attention to individual needs is effective. This investigation should possibly be extended both in the number of pupils involved and in the use of typical school situations.

Hartmann (268) investigated the effectiveness of student-instructor conferences in relation to student achievement. He used 56 equated pairs of students in elementary psychology as the subjects of a parallel group experiment in which one-half served as control by attending recitations and

lectures regularly three times a week. The other half constituted the experimental group which was allowed private conferences with the instructor in the place of the third weekly class period. In five out of the six measures of pupil attainment, four measures being objective tests, the interview group did more poorly. The investigator suggested that the alleged benefits of greater student-teacher contact are either fictitious or are effective in some other way than in the overt manifestation of scholarship.

Gates and Bennett (255) compared the daily plan of teaching spelling with the weekly plan in grades two to six inclusive. The inconsistency of the results led the investigators to conclude that the features of the general method of teaching spelling matter little in comparison "with the ability of enabling pupils to learn and use the technic of learning to spell by themselves." Gates and Graham (258) compared a program based almost exclusively upon direct study of work lists by the study-test and test-study plan with a program wherein part of the time was devoted to spelling games, puzzles, problems, etc., on the basis of the interest aroused and the spelling ability developed. Two tests were used to measure the improvement; one test on words, selected from the list which had been studied, and the other a survey test. The results seemed to indicate:

1. The two methods increase spelling ability in roughly equal degree, but that the book-directed programs combining word study with word games and other activities are more interesting under the conditions of the experiment.
2. The two programs of word study and game type used in the experiment were relatively slightly more successful with the third of the pupils highest in spelling and intelligence test scores than with the third lowest in these respects.

Still another study by Gates (256) on spelling was an investigation of the comparative superiority of teaching spelling by a method designed to foster generalization and a method of specific study of words as isolated items. More than three thousand pupils in 106 classes in a public school in Brooklyn, New York, were used in this investigation. Pupils were divided into generalization and non-generalization groups. The same basal list of words was used for both groups. The weekly list contained the same number of words and the amount of time spent in study and review was identical. For the generalization group, the list each week consisted of words grouped according to some common element as those falling under the ei, ie rule, or having some common phonetic element as in or eep. A variety of devices were used in which learning rules was but one, and a minor feature. For the non-generalization group, the words in the word list were arranged without grouping according to word-form characteristics, but were arranged in lists on the basis of a combined difficulty and frequency of use criteria. Each word was treated as a specific spelling problem. No rules were introduced, and attention was not called to common word characteristics. It was found that a broad and varied program of generalization, while it did not increase ability to spell the words studied during the term more than the specific learning method, did tend to increase to some extent the power to spell new words and especially to handle the specific derivatives

and other elements to which the generalization program was especially directed. This study also gave some information concerning the value of certain rules and generalization devices which should be of special interest.

Watson (299) summarized the findings of several experiments comparing methods of teaching and found a preference (a) for the use of individual practice with access to formulated rules over individual drill with reference to rules, (b) for class study of rules over class drill without rules, and (c) for individual drill over class drill.

Miscellaneous Studies

Unzicker (297) reported a study of the effects of typewriting on learning to read in the first grade, supplementing modern methods of teaching reading with from seventy-five to ninety minutes per week of typewriter practice. This controlled experiment included some 226 pupils in ten first-grade classes, in five schools, in Elizabeth, New Jersey, and in the demonstration school at Teachers College. The results indicated a slight but constant superiority on the part of the pupils who used the typewriter.

Crawford and Malin (246) reported an investigation of the effectiveness of three approaches to water color work: (a) a preliminary detailed pencil drawing, (b) a preliminary chalk sketching, and (c) free painting. They used three equivalent groups of 30 pupils each. The groups were equated in age, intelligence, and previous art experience. The three methods were rotated. Group 1 used pencil drawing with one group of subjects, chalk drawing with another group, and free painting with the third. The drawings were evaluated by 20 competent judges. When the evaluations were summarized, it was found that the pencil drawing method received the highest mean rating, with chalk sketching and free painting of about equal value. The number of cases used in the experiment was small, and it is possible that pencil drawing may not lead to the best ultimate development in advanced water color work.

Goetsch (263) investigated the effect of early handwriting. The subjects were children in grades three, four, and five, in two cities in which manuscript writing was taught in grades one and two, and in two cities in which only cursive writing was taught in grades one and two. Samples of handwriting were collected and scored. The results indicated that (a) pupils taught manuscript writing in grades one and two have but little difficulty in shifting to the cursive form of writing, and that (b) speed of writing in the intermediate grades is not affected by the type of handwriting instruction given in the lower grades. Pupils who have had manuscript writing write more slowly right after the shift, but they are equal or superior to the cursive group in later grades.

Clemensen (244) evaluated the worth of study outlines based on the application of the laws of learning to the general aims and specific subject-matter objectives of a course in physics. Classes of three types were organized: (a) an outline group, one using the prepared study outlines; (b) the

non-outline group, with the same teachers as the outline group, paired with the pupils of the outline group, and taught in exactly the same way as the outline group except that the study outlines were not used; and (c) an outside control group, composed of classes whose teachers were not familiar with the outlines, and who simply gave the tests for comparative purposes. The results gave strong evidence on the value of study outlines as a teaching device.

Gilbert (262) reported a study on the effect of reading on spelling on the junior, senior, and graduate university level. Gilbert (261) previously reported a study of the same problem on the ninth-grade level. This study used as subjects 389 men and women of junior, senior, and graduate levels. The conclusions were quite similar to those outlined for the ninth grade: that college students improve their spelling through reading when attention is not directed toward it (the pick-up through reading for words recently brought to one's attention is probably greater than the pick-up from words encountered more remotely); that the amount of learning of spelling through reading is highly significant; that good spellers are able to pick up more spelling through their reading than poor spellers; that superior achievement for good spellers is not effected by virtue of a slow reading rate; that there are large deviations from average rate for both good and poor spellers; and that there is no significant difference in the reading rates of those who acquired little spelling and those who acquired much.

CHAPTER V

Supervision

As a subdivision in a review of educational research, the term "supervision" presents a number of very serious difficulties. According to usual definition, supervision is concerned with those aspects of educational administration which are directly related to instruction. Thus such activities as classroom visitation and teacher meetings come to be looked upon as supervisory while oversight of buildings and grounds and purchase of supplies are viewed as administrative in character. This is, of course, a purely artificial assumption since all administrative activities carried on in a school system do have a relationship to instruction if they have any significance at all. Thus, our first difficulty grows out of the problem of determining just how widely the term "supervision" should be interpreted.

Even if we restrict the meaning of supervision to its traditional sense, we are confronted with another equally serious problem. How shall we distinguish between studies in methods of teaching, curriculum, and supervision? If, for example, a supervisor makes a study of eye movements of children, shall we classify this study under the head of "learning" or "supervision"? In all probability the supervisor would use the same technic in a study of eye movements as would be used by a teacher were he to make a similar study. It is obvious that if we follow the practice of classifying research activities according to the titles of the persons who engage in them, we shall be led into all manner of confusion in regard to both our activities and the meanings of our terms.

The result of past practices in defining what constitutes research in supervision, can be plainly seen in the organization of courses in professional education. Many schools present courses in the teaching of reading, for example. They also present courses in the supervision of reading. In addition, courses are presented in the broader aspects of supervision. Simultaneously in these schools courses are offered in the psychology of reading. It is thus entirely possible that a student may take several successive courses that have somewhat different titles but which have a more or less common scientific basis. The net effect is that the student must cover the material in a certain field three or four times in as many different courses in order to complete a given program toward a degree.

It will, of course, be argued by some that the supervisor, while using the same technics that are employed by the teacher, possesses a broader background of understanding and employs these technics on a higher level or with a higher degree of skill. Such persons would, no doubt, insist that the difference in the manner in which the various technics are employed justifies the creation of a separate category for their classifica-

tion. The presentation of such a point of view forces us to a consideration of the basic assumptions underlying the existing organization of the school with their implications regarding the roles of both teachers and supervisors as well as their bearing upon our present problem of classification of research.

Our present supervisory practices have their origin in an effort to protect the public against the most harmful forms of teaching in the school. Early supervision was essentially inspectorial in character. It sought to isolate and eliminate the highly incompetent teachers from the school system. Gradually this form of supervision undertook also to improve the practices of the teachers who were retained. We began to talk about supervision as the improvement of instruction. In this work of improving instruction there was an underlying assumption to the effect that the teacher was relatively ignorant and incompetent and at the same time the supervisor was highly competent and knew what should be done. We thus adopted the industrial principle of separation of planning and performance. The supervisor became a planner and the teacher became a performer. Through this pattern, authority became the method for the discovery of truth in a school. If the teacher wanted to know what should be done in any educational situation, his obvious approach was to ask the supervisor. In a sense this system of separation of planning and performance came to be a method of compensating for the ineffectiveness of poorly prepared teachers. It was assumed that we might get along with incompetence on the part of teachers if we only had a competent supervisor.

It is this underlying assumption of separation between planning and performance which has led some authorities to classify research largely on the basis of the titles of the persons who carry on the activity rather than in terms of the activities themselves. The science of education has come to be viewed as the property and principal domain of the supervisor. The teacher has been looked upon as an individual who does *not* in the main understand the science of education but who merely does the bidding of the supervisor who *does* understand this science. Under this scheme of organization, the teacher is somewhat analogous to a nurse in a hospital. In medical practice nursing is, of course, viewed as a somewhat different field of activity than the practice of medicine, although there are no doubt many common elements. While it is extremely dangerous to draw analogies between different professions and types of activity, there is enough of a rough comparison so that it is worthwhile for us to examine it here. If the teacher is analogous to a nurse, and if the supervisor is comparable to a physician, then our past practice in classifying research in this field is no doubt justified.

Far-reaching changes are, however, taking place in the organization of American schools. Teachers are gradually acquiring far better preparation for their work. Many school systems have a considerable number of teachers whose qualifications for their work are as good as or better than

those possessed by their supervisors. There is no longer any justifiable assumption to the effect that the supervisory officer is competent and the teacher is incompetent. Moreover, we are gradually discovering that our science of education cannot be utilized unless it becomes the property of the teachers in our classrooms. Separation of planning and performance, however successful it may have been in industry, is not appropriate in education. We are slowly discovering that the effort to compensate for incompetence on the part of teachers through such separation of planning and performance is futile.

The growth of the scientific method has also brought into question the appropriateness of authority as a pattern for the discovery of truth in the modern school. The mere fact that a supervisory officer holds to a certain point of view gives us no guarantee that that point of view is correct. Authority is concerned only with *who* is right; science is concerned with *what* is right. The two do not mix.

One must not overlook the considerations growing out of our basic social philosophy of democracy. There are many who believe that it is too much to expect children to acquire the meaning of democracy if they live in a school which is itself a dictatorship. Such persons will hold that teachers are likely to treat children in the same way in which they are treated by their supervisory officers. Thus, our more recent psychology, our educational science, and our basic social philosophy all point in the direction of a school organization which depends less upon authority and separation of planning and performance and more upon a mastery of educational science by the classroom teacher.

Rather obviously, if we demand that the teacher possess an adequate mastery of educational science, the teacher will be assigned a new role in American education. There must, of course, be corresponding modifications in the role of the supervisor. It is out of the question to delineate such roles in a situation of this kind. We must limit ourselves to the mere statement that the teacher in the future will be one who practices our educational science. The supervisor will be a leader who creates the setting in which teachers can make the greatest professional growth. This supervisor's knowledge of learning, for example, will perhaps be no different from the knowledge of learning possessed by the teacher. Neither will his knowledge of curriculum or methods of teaching be any different in kind.

If the above concepts of educational organization become basic to our classification of research, it is clear that the literature in supervision must take on different limits than it has been given in the past. Thus, psychological studies, or method studies, or curriculum studies will naturally be classified under the head of learning, methods, or curriculum. They will be viewed as elements in educational science irrespective of the role of the person who utilizes this educational science.

What then constitutes research in the field of supervision? Generally speaking, it is research which has to do with the relationships between

supervisors and teachers and the activities which are carried on in this relationship. A few examples may be helpful. Studies of the classroom activities of teachers through the utilization of various technics for objective analysis of classroom procedure can be viewed as being studies in supervision. Likewise, studies of the effectiveness of teachers meetings, demonstration teaching, individual conferences, may be looked upon as supervisory. It will, of course, be objected that the supervisor will cooperate in making curriculum studies, method studies, and the carrying of experiments in learning. This will be admitted. But in such cooperation, the supervisor is merely engaged in the practice of educational science. This science is as much the property of the teacher as the supervisor.

As indicated earlier in this discussion, it is extremely difficult and perhaps unwise to attempt to draw a line between supervision and administration. The term "educational leadership" might be used to describe both of these activities. If this plan were followed, the term "leadership" would include not only the activities now carried on directly in relationship to the problems of improving instruction but also the activities less closely related to instructional improvement such as finance, buildings, salary schedules, and the like. It is obviously outside the province of the present review to undertake so comprehensive an enterprise. In attempting to limit the present review to the areas closely related to instruction, many very arbitrary divisions have been made. Studies of the status of elementary-school principals have not, for example, been included, although it is clear that they may include material which has a direct bearing on supervision. Studies of practice teaching have likewise been left out on the assumption that they belong more properly in the field of teacher education.

Many persons actively engaged in the field of supervision either from a practical or theoretical point of view may feel that through the above assumptions we are restricting the field of supervision in an unfortunate manner. Without any question the amount of research which can be listed under this concept is considerably less than that which could be listed under certain concepts held in the past. It may, however, be argued with equal force that it is highly important for those interested in supervision to make a realistic appraisal of the situation in which they find themselves in the face of current educational developments. No good can come to the field of supervision through the careless appropriation of technics and researches from a number of related fields without any very clear notion as to their origin or appropriateness in the field of supervision. If supervision as a field of endeavor lacks a scientific basis in research today, it would be much better for us to face this fact squarely, take inventory of our position, and address ourselves to the task of studying our field of activity and through the years providing ourselves with as sound a scientific basis as possible. If a different and somewhat more rigid classification of research in the field covered by the present monograph helps to clarify our thinking on the status of supervision and its

scientific basis, it is the judgment of the authors that such a classification will have served a useful purpose.

From one point of view existing research in supervision is of doubtful value. So often the studies have been made under the conditions of questionable organization for supervision, under outmoded concepts of what constitutes effective supervision, and using technics of questionable soundness that it is very difficult to appraise the net value of the whole body of research in this field. One of the first steps in furthering research in supervision is a careful rethinking of the field.

We should not fail to point out in this connection that the term "supervision" has many unfortunate connotations in view of the developments which have taken place in this field in recent years. It implies oversight with the power to control—authoritarian in origin. It has years of traditional association with the concept of separation of planning and performance. It is out of harmony with the scientific method, with our knowledge of child growth, and with our basic social philosophy of democracy. Through the continued use of the term we tend to confuse the thinking of educators and to perpetuate anachronistic concepts of educational leadership. We are therefore stressing the term "educational leadership" in the subsequent discussion.

A few observations are in order concerning the plan of classification of studies in educational leadership. The subdivisions chosen are:

1. Philosophy of Educational Leadership
2. Organization for Educational Leadership
3. Leadership Activities
4. Evaluation of Educational Leadership.

The first of these—Philosophy of Educational Leadership—is as yet without much significant research. It is included in a separate category largely in an effort to call attention to the need for studies in this field.

The Philosophy of Educational Leadership

The entire field of educational administration at present lacks an expressed philosophy. The Sixth Yearbook of the Department of Supervisors and Directors of Instruction of the National Education Association (321) included certain studies of the judgments of teachers and supervisors concerning certain elements in a philosophy of leadership. There is need for a rethinking of the basic assumptions in leadership. Especially do we need to make a careful study of democracy as our basic social philosophy in order to secure its implications for leadership; of science as our basic pattern for the discovery of truth in order to learn its suggestions for leadership activities; of our knowledge of the child and his growth and development in order to learn what kind of school environment is most conducive to growth. Finally we need experimentation with types of organization and activities in order to determine their appropriateness to education and its peculiar demands.

The authoritarian character of past leadership has been clearly shown in such studies as those reported in the Sixth Yearbook of the Department of Supervisors and Directors of Instruction (321). Teachers in this study definitely assumed that it was the supervisor's function to determine methods to be used, content to be taught, and in general to dominate the school. In fact this study gave little evidence that teacher initiative was an important factor in present leadership. For some time, however, theorists have been advocating more dependence upon teacher initiative. One instance is the advocacy of so-called visitation "on call." Thomson (328) and Ringo (323) reported experiments in an effort to apply the principles of teacher initiative in an actual school situation. Thomson kept a card on record of all the calls which teachers sent her for help. Thus she was able not only to keep a record of the number of calls but the nature of the requests and the characteristics of the teachers who made them. Many critics of the teacher initiative plan insist that when it is used only the really competent teachers will call for help. Thomson proved that in her experiment at least this was not true for she provided for the rating of the teachers and the teachers with the lower ratings asked for more help than those with the higher ratings. Thomson followed the development of a supervisory plan from the traditional to the teacher-initiative form over a period of four years and stated that the data "clearly indicated the feasibility" of the program. It was, in her opinion "constructive, stimulating, enlightening." She made this further comment:

> Teachers with university training react more favorably to call supervision than teachers with teachers college training. Teachers who had taught less than six years accepted the new program more readily than those with more experience.

Ringo's study (323), which covered a period of three years, set forth the benefits of supervision based on teacher initiative both to the teacher and the supervisor, and its disadvantages, among which was cited the fact that some teachers call for too much help. However, Ringo declared that under the new plan "there was general growth in independence."

Without doubt the success of the teacher-initiative plan is largely dependent upon the degree of professional interest which prevails in a school system, or which the leader is able to arouse. These studies should be repeated in a variety of ways to give more dependable conclusions.

The tenacity of the authoritative concept of leadership was, however, well shown by a study by Herron (312). It was clear that teachers, leaders, and even specialists in the field hold that most of the really important activities and decisions in the school belong in the province of the supervisor. Ninety percent of the supervisors, superintendents, and recognized leaders in education who expressed themselves made the supervisor responsible for 92 out of 123 specific activities. With the exception of one item, the construction of standardized tests, 60 percent of these judges checked the entire list to the province of the supervisor. More than

90 percent made her responsible for all the activities connected with the planning of the supervisory program and the constructing and revising of the course of study, and almost 80 percent considered that one of her activities should be the performance of clerical duties. It is interesting to note that the judges agreed unanimously on three specific activities: keeping in touch with the latest developments in the field of education; making self-preparation for group conferences; and making self-preparation for supervisory visits. Also, out of the entire list of 123 activities, there were only 15 upon which the judges were not in accord as to their being of major or minor importance.

It is impossible to expect that any widespread progress toward a higher type of teacher leadership could be accomplished without adequate training facilities; and from studies made, one in the field of general supervision by Herron (311) and one in music by Thomas (326), we can do no better than to quote from their conclusions. Herron (311:128) stated:

> Obviously, further evidence of the inadequacy of the present opportunities for the training of general elementary supervisors is unnecessary. If thirty-eight per cent of the teacher training institutions which have set up a specific curriculum for general elementary supervisors do not list a single course in supervision in the curriculum, and fifty-four per cent require but one course, what has otherwise seemed a worthy effort to improve supervision is but an empty farce. The mere labeling of curricula and adding of courses will not suffice. An adequate curriculum for the professional training of general elementary supervisors and directors will obtain only when teacher-training institutions, or those who are responsible for curriculum planning, become thoroughly familiar with the needs of general supervisors, and the instructional materials of the required courses are selected on the basis of their fitness in training for the specific duties and activities of such officers.

Thomas (326) found that according to the standards set for music supervisors by the Music Education Research Council, "Teachers colleges fail to reach the mark in numbers of hours of music theory and applied music required by approximately twenty-one semester hours."

Leadership Activities

In considering studies in the field of leadership activities, little space has been given to the traditional activities such as visitation, teachers meetings, demonstration teaching, and intervisitation. Older studies of these activities made through inventory of teachers' judgments concerning the value of these activities present a discouraging picture. An example is to be found in a study by Hughes and Melby (314) which showed that over 60 percent of the teachers interviewed held that the visits which had been made to their classrooms and the conferences which followed had not changed their teaching in any way. In McGinnis' study (317), 208 elementary-, 101 junior high-, and 99 senior high-school teachers were asked this question:

> Do supervisory visits help you solve problems of (a) classroom management, (b) methods of teaching, (c) diagnosis of pupils' difficulties, (d) the selection of subjectmatter, and (e) the selection of materials of instruction?

From the data collected, three things were evident:

1. Supervisory visits are effective to a high degree in helping the teachers to solve problems of classroom management in the elementary, junior high, and high school.

2. Supervisory visits are considerably less effective in the matter of problems of methods of teaching than in problems of management.

3. In helping teachers to solve problems of diagnosis, selection of subjectmatter, and selection of materials supervisory visits are effective to a high degree in the elementary and junior high school and to a low degree in the high school.

Many reasons have been assigned for the lack of faith in these activities on the part of teachers. Important among these may be the general spirit in which they are carried on and the nature of the technics employed.

Technics for analyzing classroom procedure—One of the most important issues with reference to the various technics has to do with their objectivity, reliability, and validity. Barr (304:565) for instance, after investigating results of the use of nineteen more or less typical instruments for the measuring of teacher ability, said:

> . . . In general, the values calculated were exceedingly low, the most of them, when expressed in terms of coefficients of correlation, falling between 0 and .35. It is unnecessary to say that such results for so large a number of more or less typical instruments for the measurement of teaching ability, are, of course, disappointing . . . . There is undisputable evidence that there is much more work to be done before we can be said to measure teaching ability accurately . . . . Other data showed just how inaccurate our ordinary judgments about teaching ability really are.

McGinnis (317) asked nearly 3,000 teachers this question: "In your opinion as a teacher, to what degree does the use of checklists and teacher rating devices represent good supervisory practice?" Less than 14 percent thought they were valuable to a high or even fairly high degree, while 86 percent expressed the opinion that they were valuable to a low or very low degree. On the other hand, of the 200 or more supervisors who were asked the same question, 50 percent held them to be valuable to a high or fairly high degree; and only 19 percent rated them as being valuable to a very low degree in comparison with 51 percent of the teachers who gave them that rating. McGinnis (317:46-47) made this comment:

> The number of cases . . . is small in comparison with the total number of teachers and supervisors in the American schools . . . no claim is made that these data are reliable for the country as a whole. But they are reliable as representing the opinion of nearly 3,000 teachers of an unselected group in three states. The fact that 86.2 percent of these teachers think the use of check lists and teacher rating devices represents good supervisory practice to only a low or very low degree is strong evidence that there is something decidedly wrong with such devices as now used.

Present devices for analyzing classroom precedure thus seem to have little statistical merit and in addition appear to be given little weight in the opinions of teachers. The concern for the statistical merits of the various technics seems to suggest that leaders in the field have been

primarily concerned with the rating function rather than with the problem of helping teachers to improve. Thus one may find that a particular device may possess only a rough accuracy, yet it may be helpful in making a teacher aware of her problems. If it serves this purpose well, we need not be greatly concerned about statistical merit. Of course, if we want technics for rating teachers for salary purposes or status, that is a different matter.

It is possible that teachers have yet to be convinced that the various checklists and devices for analyzing and describing classroom procedure are really used in an effort to help them become better teachers. Perhaps they still believe that supervisors use them primarily for rating purposes. It is likely that this feeling is responsible for the low regard in which the various technics are held rather than their lack of statistical merit.

Relatively little has been done with self-checking, and self-evaluation. This fact probably throws light on the amount of teacher initiative prevailing in our current educational leadership. The teacher is not assumed capable of evaluating herself. This may be true of teachers at present since they have had little practice. One study by Rankin (322) indicated that teachers rate themselves too high. In this case, several hundred teachers were asked to check the items in which they needed supervisory assistance in music. It is a well-known fact that grade teachers have scant preparation for the teaching of music; yet substantial numbers of these teachers indicated that they felt fully competent to handle music work.

In past leadership the rating function has loomed so large that most teachers are probably fearful of any checking or rating scheme lest its use reflect on their standing as teachers. Until supervisors can establish a different relationship with teachers, self-rating or self-analysis will not make much progress.

Cooperative efforts such as those described by McClure (315) are promising. Many of the devices for analyzing or describing classroom procedure could be adapted to self-analysis. Illustrations may be mentioned in the studies by Brand (306), Fields (309), and McCracken (316).

One interesting outcome of the application of the various technics for analyzing and describing classroom procedure seems to be the general disappointment with the conditions they reveal. For years various theorists have attacked the barren question and answer recitation; yet a study by Hughes and Melby (314), in the large, well-supported high schools, showed this method to be used in over 70 percent of the classes observed in social studies. In general, one feels that attempts to describe classroom procedure tend to show an enormous lag between our theory and practice in education. This situation would seem to suggest that the use of such devices by supervisory officers might become a stimulating procedure.

The development of some of the more recent methods of classroom procedure such as the Morrison mastery technic and the activity school have created new problems in the analysis of classroom procedure. When

existing technics are applied to some of these newer procedures, they do not appear to be appropriate. New technics must be developed. Since these newer methods depend very largely on a rich classroom experience for their effectiveness and since their outcomes are difficult to measure by means of traditional tests, there is greater need than ever for technics of describing the learning activities of children. Another way to state it is that the educators are more interested in the nature of the learning activities than they are in the exact facts or skills learned. If we can devise methods for describing the learning activities of children we can at least know how children live while they are learning even though we cannot measure all that is learned.

The nature of some of the newer methods also attaches a greater importance to self-analysis and description. Occasional classroom visits are of little value in describing a classroom activity which is continuous over a period of several weeks. In fact, in such cases the teacher herself is probably the best judge of the effectiveness of her own work. We, therefore, need technics for describing and recording classroom activities so that teachers can appraise their own work.

Teacher difficulties—Studies of teacher difficulties are in many ways closely related to technics for analyzing classroom procedure. The chief difference lies in the fact that the difficulties are usually secured as reported by teachers themselves. A study by Brayton (307) indicated that sophomores in a training institution were less aware of their difficulties than juniors and seniors and that experienced teachers report a still larger number of difficulties. Apparently the teacher must acquire considerable theoretical knowledge and practical experience before she can locate her own problems. This same study lists 49 items, 32 of which are generally agreed to be of "very serious difficulty." Out of 20 of these listed in their rank order, only 5 are personality traits while the other 15 have more to do with education, or professional attitude.

Serious difficulties are presented to the traditional supervisor who asks teachers to report their difficulties to her. One teacher said, "How can you expect me to reveal my difficulties today to a person who comes tomorrow to rate me with regard to my status in the school system?" If supervisors are to make serious use of inventories of teacher difficulties, they will need to establish a different relationship to teachers.

Evaluation of Leadership

The effectiveness of a program of leadership should not be assumed without subjecting it to critical analysis. Greenfield (310:123), in his study of elementary supervision, gave three reasons for evaluation:

1. Because, while supervisors have been content to take for granted the effectiveness of their supervision, teachers have long since questioned its worthwhileness

2. Because, if the supervisor's position is to withstand the barrage of economic scrutiny, it will have to be justified by productiveness . . . and

3. Because a critical evaluation of the products of supervision should stimulate supervisors to improve supervision.

These were his conclusions at the close of the two-year period over which the study was made:

1. The time spent in bringing teachers into coöperative working relationship, stimulating them to consciousness of a professional attack upon teaching problems, and enthusing them with a modern philosophical viewpoint of education which shifts the emphasis from factual subject matter to child interest and activity, may not result in a statistically significant difference in the amount of factual material learned. The fruits of such a program should be cumulative and any indication of improvement is indicative of the functioning of such a program.

2. While an average critical ratio of positive .524 is not statistically significant, it can be assumed from these data that teaching can be modernized without jeopardizing factual learning.

3. The fact that the results of a supervisory program such as this do not reveal themselves materially in achievement tests impresses the writer with the necessity for the use of data gathering devices which will measure the more elusive developments in child personality.

4. The teachers coöperating in this program made some definite improvement in their teaching practices. It is interesting to note that the teachers making the greatest improvement were also the persons whose groups made the most significant gains in pupil achievement.

Ullemeyer (329), in an endeavor to learn "to what extent music supervision has kept pace with developments in education and in supervision generally," drew these conclusions:

1. Modern educational movements as a whole are not expressed in the practice of public school music teaching.

2. Supervisory activities employed in schools observed are designed for didactic supervision.

3. Absence of initiative and originality and lack of understanding of the purposes of supervision on the part of teachers who teach music are characteristics of teachers who retard progress of classroom music.

4. The lack of preparation in music on the part of classroom teachers constitutes a major problem in music supervision.

5. Music supervisors as a whole are well-trained and progressive in their own specific field but they are not trained in the field of general educational philosophy and supervision.

6. There is a need for problem solving and research by supervisors and teachers of music.

The findings by Brady (305) in his study of the objectives and functions of supervision follow:

1. The supervisor must have a plan and a philosophy of general education and of education in his own special field.

2. His activities must be an attempt to evaluate and improve the procedures within his department in the light of this philosophy.

3. He must keep abreast of the findings in his field and modify his plan when it has been demonstrated it is advisable for him to do so.

4. He must be understanding, sympathetic, constructive, and impersonal in his supervisory functions.

5. So far as is possible, he should effect modification of teaching methods and departmental procedures through the efforts of his stronger teachers. Discussion by a small group of teachers facing the same problem, with the intelligent, sympathetic leadership of the supervisor, will undoubtedly result in plans much more effective than by declaration of the supervisor alone.

6. Supervision should be upon an objective basis whenever possible. Visitation and the conference are supplemented by check-lists, unit tests, and departmental tests as the means employed to accomplish this aim (305: 141).

The existing literature on evaluation, a few samples of which have been submitted above, is exceedingly disappointing. The whole project of evaluating leadership is beset with difficulties. In the first place we are not clear on the place or role of the leader in educational progress. Suppose that in a certain school there is no supervisor. This fact does not prevent educational progress in that school. There might be curriculum projects, experimentation, and many other evidences of growth on the part of teachers and improvement in educational procedure. Let us now assume that a supervisor is employed. How shall we evaluate her presence and leadership? Suppose she changes the curriculum and methods used. Will there be greater learning on the part of children? We cannot tell. Suppose children learn less under the new curriculum? Has the supervisor failed? Not necessarily. She may have been in error in her choice of procedures. It should be noticed that in this instance we are confusing leadership and problems of curriculum or method. It would seem that curriculums and other elements in education must be evaluated as such, apart from supervision. Nearly all of our experiments in evaluation so far confuse the various factors involved.

Teacher growth is probably the best measure of the supervisor's effectiveness. That is not to say that teacher growth is impossible without a supervisor. Does the presence of the supervisor or of a certain supervisory set-up, accelerate or enrich teacher growth? Here we have practically no studies.

In evaluating leadership complete dependence cannot be placed upon controlled experimentation. Probably the most helpful work will come from case studies. In these we shall keep careful record of the nature of the organization for leadership and its activities. We shall also describe what happens in the school in teacher activities along lines of professional growth. In these cases we shall not be able to say what growth would have occurred if different procedures had been followed. We can only say that in a given situation certain things were done and here is a picture of what happened. If we have a large number of such cases, certain generalizations will be possible. In such procedures we would be following technics somewhat similar to those utilized in medical case studies.

Research in leadership is essentially a problem of evaluation. We shall probably make progress here largely as our leaders learn to describe and record their activities and their attendant development. We need to

accumulate such data in regard to a wide variety of leadership activities and types of organization. It is especially important that the various types of research undertaken should take proper cognizance of the educational program in the schools. In existing practice there is too often a conflict between the objectives of the school and those of the leadership; between the principles basic to learning on the part of children and those which are basic to the activities of the supervisor. Sound evaluation will be possible only as leaders have clear objectives and as they are consistent in their application.

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